

BEFORE THE GREEN TRIBUNAL SOUTHERN BRANCH
CHENNAI

Application No 39 of 2024 (SZ)

In the Matter of

Mr. Jonatt Jose

Applicant

Versus

The Secretary, MoEF&CC & others

Respondents

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Signed and verified on this...25th day of March 2025


Counsel for Applicant

Amarjeet Kumar vs Union Of India on 17 March, 2021

Author: Adarsh Kumar Goel

Bench: Adarsh Kumar Goel

Item Nos. 05 & 06

Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

(By Video Conferencing)

Original Application No. 67/2019

(With report dated 12.01.2021)

Sumit Kumar

Applicant

Versus

State of Himachal Pradesh & Ors.

Respondent(s)

WITH

Original Application No. 138/2019
(I.A. No. 65/2019, I.A. No. 686/2019
& I.A. No. 762/2019)

Amarjeet Kumar

Applicant

Versus

Union of India & Ors.

Respondent(s)

Date of hearing: 17.03.2021

CORAM: HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE MR. JUSTICE SHEO KUMAR SINGH, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Respondent: Mr. Raj Kumar, Advocate for CPCB
Mr. Sharat Kapoor, Advocate for SAIL

ORDER

1. This order is being passed in continuation of earlier orders dated 28.03.2019, 04.07.2019 and

16.07.2020 on the subject. The issue for consideration is the regulation and control of use of Pet-coke and furnace oil (FO) as fuel to prevent damage to environment and public health.

2. Vide order dated 28.03.2019, the Tribunal considered the response of the CPCB dated 15.2.2019 on the subject in the light of orders of the Hon'ble Supreme Court dated 24.10.2017 (banning use of petcoke and FO in NCR States) and 17.11.2017 (suggesting States/UTs to take similar measures) and further Hon'ble Supreme Court order dated 13.12.2017, 05.02.2018 and 26.07.2017 allowing use of petcoke in industries/processes which use petcoke and furnace oil either as feed stock (Calcined Pet Coke (CPC) units, Aluminum industries) or where they get absorbed along with product in manufacturing process (cement, Lime Kiln, calcium carbide industries) and the expert opinion about harmful effect of their use generally. Applying the 'Sustainable Development' 'Precautionary' principles, the Tribunal directed CPCB to adopt measures for regulation and control. Relevant part of the order is extracted below:-

"3. Accordingly, the response has been received vide e-mail dated 15.02.2019 from the CPCB. The conclusion therein is as follows:

"Considering the various directions and orders of Hon'ble Supreme Court regarding use of petcoke and furnace oil containing higher sulphur, it is required that States and UTs, including Himachal Pradesh, formulate fuel policies regarding use of petcoke and FO in light of Hon'ble Supreme Court order dated 24.10.2017 (banning use of petcoke and FO in NCR States) and 17.11.2017 (suggesting States/UTs to take similar measures) and further Hon'ble Supreme Court order dated 13.12.2017, 05.02.2018 and 26.07.2017 allowing use of petcoke in industries/processes which use petcoke and furnace oil either as feed stock (Calcined Pet Coke (CPC) units, Aluminum industries) or where they get absorbed along with product in manufacturing process (cement, Lime Kiln, calcium carbide industries). It is relevant to mention that use of Raw Petroleum Coke (RPC) in CPC units has been allowed with condition of 90% recovery of SO₂ emission. The same principle may be followed in industrial processes where use of FO as feed stock is considered by States/UTs."

4. The reason for the above conclusion is huge emission of SO₂ and other pollutants on account of use of Petcoke and furnace oil by the industries which has been banned in several States but continuing in some of the States. A Technical Expert Committee was constituted to evaluate pollution load and as per the report of the said Committee, pollution load of SO₂ is four times higher when Low Sulphur Heavy Stock (LSHS) and LDO are used.

5. On consideration of the matter, we find that in view of established adverse impact of use of Petcoke and furnace oil by the industries, prohibition of its use may need consideration on 'Precautionary' principle as well as 'Sustainable Development' principle statutorily recognised under the National Green Tribunal Act, 2010, the industries may have to switch over to alternatives and cleaner fuels. We may note that air quality in many of the locations in India is not of prescribed quality and as many as 102 cities have been identified as "non-attainment cities". The said cities are spread over almost in all the States, including the State of Himachal Pradesh. 100 industrial clusters

are declared critically polluted throughout India. This makes it imperative that any measure which is helpful in controlling air pollution must be preferred to the extent viable. These aspects have been considered by the Tribunal in order dated 08.10.2018 in O.A No. 681 of 2018 in News item published in "The Times of India" Authored by Shri Vishwa Mohan Titled "NCAP with multiple timelines to clean air in 102 cities to be released around August 15" and order dated 13.12.2018 in Original Application No. 1038/2018 in News item published in "The Asian Age" Authored by Sanjay Kaw Titled "CPCB to rank industrial units on pollution levels" respectively.

6. In view of the above, we accept the report of the CPCB and direct that the same may be given effect to. The CPCB may issue appropriate directions in this regard to the concerned States and Union Territories indicating coercive measures against those who fail to comply with the directions. Response of the States be taken and compiled within two months and further action proposed by way of a report to this Tribunal before the next date."

3. The above order was reiterated vide order dated 04.07.2019 and further report in the matter was directed to be furnished by the CPCB.

4. The matter was last considered on 16.07.2020 in the light of compliance report filed by the CPCB on 14.07.2020 in respect of action taken in several States/UTs. It was observed:

"4. In view of above, compliance report has been filed by the CPCB on 14.07.2020 with summary of action taken reports from 27 States/UTs. Some of the reports of the States/UTs are contrary to the orders of the Tribunal referred to above. Reports which are non-compliant with the orders of this Tribunal based on order of the Hon'ble Supreme Court will stand rejected to that extent. Orders of the Tribunal be given effect and CPCB may ensure compliance by issuing such further direction as may be necessary in exercise of its statutory power.

5. The CPCB may file its action taken report within four months by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/ OCR Support PDF and not in the form of Image PDF."

5. Accordingly, further report has been filed by the CPCB on 12.01.2021 as follows:

"7. Taking cognizance of the latest order dated 16.07.2020 of Hon'ble Tribunal, two more SPCBs namely Assam and Odisha provided ATR, and two SPCBs namely Goa and Uttarakhand provided updated ATRs, whereas two other SPCBs namely Sikkim and Lakshadweep have provided updated ATRs after a draft status report was circulated by CPCB to SPCBs/PCCs on 21.12.2020 for updating (Annexure IV). Thus, ATRs have been submitted by total twenty-nine States/UTs on CPCB's direction dt.

-23.08.2019. A summary of the ATRs of twenty nine States/UTs, along with copies of ATRs is annexed at Annexure-V. The ATRs from 29 States/UTs reveal that:

- Twelve States/UTs have informed about use of both pet coke and FO not allowed (Goa, Manipur, Mizoram, Nagaland, Sikkim, Tripura, Uttarakhand, Andaman & Nicobar, Chandigarh, Daman & Diu, Dadra & Nagar Haveli, Lakshadweep)
 - Five States/UTs have informed about use of pet coke allowed only in certain processes/ industrial sectors, and use of FO allowed with conditions (Bihar, Chhattisgarh, Gujarat, Maharashtra, Tamil Nadu)
 - Four States / UTs have informed about allowing use of pet coke /FO with conditions (Andhra Pradesh., Kerala, Madhya Pradesh, Telangana)
 - Eight States / UTs are in the process of finalising their draft fuel policies (Assam, H.P. J&K, Karnataka, Meghalaya, Odisha, Punjab, Puducherry)
8. ATR is still awaited from the remaining three States/UTs, namely, Arunachal Pradesh, Jharkhand and West Bengal."

6. We are informed that the matter has also been dealt with vide order dated 09.10.2018 in W.P. No. 13029/1985, M.C. Mehta v. Union of India & Ors., by the Hon'ble Supreme Court, wherein CPCB report dated 04.10.2018 has been quoted which is as follows:

"2. xxx.....xxx.....xxx....."

i. Raw Petroleum Coke is feed stock for producing calcinated petroleum coke which is a raw material for anode making in aluminium industries. Therefore, calcination of Raw Petroleum Coke is a pre-requisite to produce anode grade calcined pet coke having Sulphur content less than 3.5%.

ii. As per BIS guidelines, calciners are permitted to use high Sulphur containing raw petroleum coke for making CPC having Sulphur content less than 3.5%. There shall be emission of SO₂ in high concentration (para 1 of results) which needs to be treated in Flue gas desulphurization system having efficiency of Sulphur removal more than 90%."

7. It is stated that the matter is still being considered by the Hon'ble Supreme Court.

8. Accordingly, CPCB may take further action in the matter in compliance of directions already issued, subject to orders of the Hon'ble Supreme Court.

The applications are disposed of.

A copy of this order be forwarded to the CPCB and State PCBs/PCCs by e-mail for compliance.

In view of above order, all pending I.A.s will stand disposed of.



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(54) **PROCESS FOR MANUFACTURING SILICON CARBIDE**

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(57) **ABSTRACT**

(21) Appl. No.: **14/130,649**

A process for manufacturing SiC wherein the emissions of polluting gases are minimized, by reduction of silicon oxide by an excess of carbon, the process including electrically heating a resistor at the heart of a mixture of raw materials consisting of a carbon-based source chosen from petroleum cokes and a source of silicon, especially a silica having a purity of greater than 95% of SiO₂, in order to give rise, at a temperature above 1500° C., to the simplified reaction: SiO₂+3C=SiC+2CO (1), wherein the carbon-based source first undergoes a treatment for removing the contained hydrogen, so that its elemental hydrogen content (EHC) is less than 2% by weight.

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PROCESS FOR MANUFACTURING SILICON CARBIDE

[0001] The invention relates to a novel process for manufacturing silicon carbide.

[0002] Silicon carbide is a material that is extremely rare in the natural state due to the particular conditions needed for its synthesis (very high temperature, highly reducing atmosphere). However, this material has very many advantages, mainly due to its very high hardness and its refractory properties. It is especially used as an abrasive or else in the construction of furnaces, but also more recently as a wide-band semiconductor. According to another more recent application, it is also used as a porous material for the manufacture of particulate filters. All these applications account for the fact that the demand for this material is very large and is increasing at the present time.

[0003] As is known, it is possible to synthesize silicon carbide by the high-temperature action of silicon on a carbon-based precursor or by reduction of a silicon precursor by a carbon-based precursor.

[0004] More specifically, according to this second mode, the silicon carbide is essentially produced from a carbon-based source and a source of silica.

[0005] The most common manufacturing process is the Acheson process, which consists in electrically heating a resistor at the heart of a mixture of the two raw materials in order to give rise to the simplified reaction:



[0006] at a temperature above 1500° C., and even far above 2000° C. at the heart of the reaction zone.

[0007] As is known, a large amount of gas is emitted, generally to the open air, whether this is during the phase when the furnace is heated, during the silicon carbon synthesis phase or else during the cooling.

[0008] The source of silica is in general sand having a purity of greater than 95% of SiO₂ (preferably greater than 99% of SiO₂). The source of carbon is in general and preferably petroleum coke (residue of the distillation of oil). This petroleum coke is low in mineral ashes (less than 1% in general, measured according to ISO 1171). It also contains sulfur (from 0.2% to 5% in general according to ISO 19579) and volatile species (frequency around 10%, according to ISO 562).

[0009] In the present description, unless otherwise indicated, all the percentages are given by weight, on the basis of dry matter.

[0010] In such petroleum cokes, the elemental hydrogen weight content, also referred to as EHWC in the description, is typically of the order of 4%. The value of EHWC according to the invention is measured according to the ISO TS 12902 standard.

[0011] The use of such a coke during the manufacture of SiC may lead to an undesirable impact in terms of health, safety or environment (HSE), by producing harmful gaseous species such as H₂, CH₄, H₂S, SO₂, mercaptans, amino compounds and aromatic organics.

[0012] Condensable species of the tar or PAH (polycyclic aromatic hydrocarbon) type, which are also undesirable from the HSE point of view, may also be released in large amounts, depending on the source of carbon. It should be noted that pure sources of carbon (>99% of C) are much more expensive and are incompatible with mass production.

[0013] In order to solve the problem of the release of gases during the Acheson process, patent U.S. Pat. No. 3,976,829 describes a process for manufacturing SiC comprising gas collection means. More specifically, it is proposed in this publication to affix additional coverage means on top of the reaction mixture positioned around the electrical resistor of the Acheson furnace that are coupled to means for collecting the gaseous products emitted during the synthesis of SiC. The gases collected are then treated and/or burnt, so as to prevent the emission of harmful reduced gases. Nevertheless, this technique requires delicate handling and fine process control. In particular, the gases from the process being toxic and/or explosive, typically with a gas mixture comprising of the order of 50 vol % of CO and 30 vol % of H₂. Such a mixture entails and requires very fine and difficult control of the gases present under the cover. Such a control is made even more difficult since the Acheson process is, as is known, subject to some gaseous eruptions due to local overpressures. During such phenomena, the cover placed on top of the furnace may rapidly lose its usefulness and worse, in the extreme, generate large explosions due to the storage of a potentially uncontrolled volume of explosive gas above the furnace. In addition, the large emissions of condensable species (PAHs) during the Acheson process lead to the rapid clogging up of the pipes and other means used for the collection and discharge of the gases, which makes the management of such an installation costly and complex.

[0014] The objective of the present invention is, according to a first aspect, to propose an alternative process for manufacturing SiC from a coke laden with hydrogen-containing compounds (that is to say compounds with a weight percentage of contained hydrogen of at least 2%, or even at least 3% at the start), very particularly a petroleum coke, coal coke or coke resulting from biomass, which makes it possible to limit the releases of harmful species during furnace temperature rise, SiC synthesis and furnace cooling phases.

[0015] Without departing from the scope of the invention, other sources of carbon such as cokes resulting from biomass or from coal may also be used.

[0016] More specifically by application of the present process, it is possible to obtain many advantages during the procedure for producing SiC:

[0017] drop in the emissions of gases (except CO, which is intrinsic to the reaction (1)) and condensable species (PAHs) and in their undesirable effects (toxicity risks, odors, overpressures), especially in the case of emissions to the open air,

[0018] in particular, drop in the emissions of sulfur-containing gases for the weakly bonded fraction of sulfur, and drop in the emissions of amino compounds,

[0019] removal of fine particles (subject to fly-offs) by the agglomeration of carbon-based particles.

[0020] According to another aspect, the process that is the subject of the present invention additionally enables, under its specific implementation conditions, a drop in the energy consumption of the overall reaction for formation of SiC, in particular of the electrical energy consumption of the furnace, compared to a Acheson type process carried out under customary conditions.

[0021] More specifically, the present invention relates to a process for manufacturing SiC, wherein the emissions of polluting gases are minimized, comprising the reduction of silica by carbon, said process consisting in electrically heating a resistor at the heart of a mixture of raw materials con-

sisting of a) a carbon-based source selected from cokes, especially petroleum coke, b) and a source of silicon, especially a silica having a purity of greater than 95% of SiO₂, in order to give rise, at a temperature above 1500° C., to the simplified reaction:



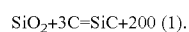
[0022] Said process is characterized in that said carbon-based source first undergoes a treatment for removing the contained hydrogen, so that its elemental hydrogen content (EHWC) is less than 2% by weight.

[0023] The process according to the invention especially comprises the following steps:

[0024] mixing of raw materials consisting of a carbon-based source selected from cokes, the elemental hydrogen content (EHWC) of which is greater than 2%, or even greater than 3%, by weight and a silica having a purity of greater than 95% of SiO₂,

[0025] said carbon-based source undergoing, before the mixing thereof with the silica, a treatment for removing the contained hydrogen, so that its elemental hydrogen content (EHWC) is less than 2% by weight,

[0026] electric heating of said mixture of raw materials by a resistor positioned at the heart thereof, up to a temperature of greater than 1500° C., in order to give rise to the reduction of the silicon oxide by the carbon, at a temperature above 1500° C., according to the simplified reaction:



[0027] The expression “minimization of the emissions of pollutants” is especially understood, within the meaning of the present invention, to mean:

[0028] a volume content of H₂ of the gas emitted by the furnace (on average during the SiC formation phase, before any dilution, especially atmospheric dilution and before any subsequent treatment) of less than 10 vol %, preferably of less than 5% or even less than 1%,

[0029] a volume content of CH₄ of the gas emitted by the furnace (on average during the SiC formation phase, before any dilution, especially atmospheric dilution and before any subsequent treatment) of less than 1 vol %, preferably of less than 0.5% or even less than 0.1%,

[0030] a volume content of H₂S of the gas emitted by the furnace (on average during the SiC formation phase, before any dilution, especially atmospheric dilution and before any subsequent treatment) of less than 1000 ppm vol, preferably of less than 500 ppm vol,

[0031] a volume content of SO₂ of the gas emitted by the furnace (on average during the SiC formation phase, before any dilution, especially atmospheric dilution and before any subsequent treatment) of less than 500 ppm vol, preferably of less than 200 ppm vol,

[0032] a volume content of COS of the gas emitted by the furnace (on average during the SiC formation phase, before any dilution, especially atmospheric dilution and before any subsequent treatment) of less than 1000 ppm vol, preferably of less than 500 ppm vol, or even 100 ppm vol,

[0033] a PAH content of less than 500 ng per m³ of gas emitted by the furnace, or less than 100 ng per m³ of even less than 50 ng per m³.

[0034] Preferably, the coke, after dehydrogenation, has a content of less than 10 ng/mg, or even less than 1 ng/mg or else less than 0.5 ng/mg for each of the following PAH com-

pounds: naphthalene, acenaphthene, fluorene, phenanthracene, chrysene, anthracene, pyrene, benz[a]anthracene, benzo[a]pyrene, dibenzo[a,h]-anthracene, benzo[ghi]perylene, benzo[k]fluoranthene, fluoranthene, benzo[b]fluoranthene and In[1,2,3-cd]P).

[0035] It has been found by the applicant company that the overall energy input needed for the manufacture of SiC, including a coke pretreatment step, could be substantially reduced compared to the conventional Acheson process in which the petroleum coke is directly brought into contact with the silica. In particular, the energy balances carried out show that the energy efficiency of the Acheson furnace in a process according to the invention is against all expectation substantially improved.

[0036] In particular, establishing, slightly oxidizing atmospheres in the pretreatment furnace, that is to say atmospheres for which the oxygen content is controlled, further reduces the overall energy input by the (exothermic) combustion of the volatiles in the furnace.

[0037] Very particularly, the overall power consumption needed for the manufacture of SiC may advantageously be substantially reduced if the coke pretreatment is carried out by combustion. Such an embodiment improves the balance of greenhouse gas emissions in the case of electricity having a fossil primary source.

[0038] Finally, the greenhouse gas emissions are also greatly reduced due to the conversion of strong greenhouse gases emitted in the conventional process (such as methane) into CO₂ during the pretreatment combustion.

[0039] Preferably, the residual elemental hydrogen content of the petroleum coke is less than 1% and very preferably less than 0.5%, or even less than 0.1%.

[0040] In particular, the best energy balances of the overall process for manufacturing SiC have been found when the EHWC of the treated coke was between 0.01% and 0.1%, especially between 0.01% and 0.05%. In particular, the additional energy expenditure needed to obtain an EHWC of less than 0.01 resulted in an overall energy balance that was then degraded, due to the energy expended during the preliminary petroleum coke dehydrogenation step, without however the releases of pollutants being substantially reduced thereby.

[0041] According to the invention, the treatment for removing hydrogen from the source of carbon is carried out before it is mixed with the source of silicon. Thus, the studies carried out by the applicant company have shown that, against all expectation, the energy balance is on the whole improved.

[0042] In one preferred mode of the invention, the hydrogen removal treatment is selected and its conditions fixed such that less than 5 wt %, preferably less than 1 wt % of the fixed carbon of the coke (on the dry product) is removed at the same time (NF M 03-006).

[0043] Very particularly and for this purpose, the treatment is preferably carried out in an atmosphere that is not very oxidizing. In particular:

[0044] According to a first possible mode, the hydrogen removal treatment may for example be a controlled heat treatment of the coke in an electric furnace, under an inert atmosphere, for example of argon or nitrogen.

[0045] According to another preferred mode, the hydrogen removal treatment is a heat treatment in a fired furnace, especially a rotary fired furnace, between 1000° C. and 1350° C., preferably between 1250° C. and 1350° C. During this treatment, the oxygen partial pressure of the calcination atmosphere is advantageously less than

5% of the total pressure of the gases; preferably less than 1% of the total pressure of the gases. According to one possible embodiment of this mode that makes it possible to minimize the energy used during the removal treatment, the gases resulting from the hydrogen removal step are at least partly used as fuel for said fired furnace, as already previously described.

[0046] According to another implementation aspect of the present invention, the dimensions of the resistor of the furnace for the synthesis of SiC, especially its cross section and/or its length, are advantageously configured as a function of the electrical resistivity of the dehydrogenated carbon-based source, in order to optimize the efficiency thereof.

[0047] According to one advantageous mode of the present invention, on top of the reaction mixture positioned around the electrical resistor of the Acheson furnace, additional coverage means are put in place, such as, for example, those described in patent U.S. Pat. No. 3,976,829, these coverage means being coupled to means for collecting (and discharging) the gaseous products emitted during the synthesis of SiC. In such a case, it then becomes easier to treat the polluting gases thus collected. Such a mode makes it possible, in particular, to solve the problems disclosed previously in connection with the system proposed in patent U.S. Pat. No. 3,976,829: the preliminary dehydrogenation step according to the invention results in an extremely significant reduction in hydrogenated compounds, organic compounds, sulfur-containing compounds or PAH-type condensable compounds in the gases resulting from the reaction, as is described in the examples which follow. Such a reduction makes it possible to efficiently reduce the risks linked to the hydrogen gas, and also the problems of clogging/corrosion of the recovery and collection device.

[0048] Finally, the retreatment of a gas that does not contain very much sulfur and consists almost exclusively of carbon monoxide is of course greatly facilitated compared to that resulting conventionally from an Acheson furnace, in which gases of very different nature and properties may be mixed, in very variable amounts (see in particular Table 1 which follows).

[0049] The invention and its advantages will be better understood on reading the detailed description which follows. Of course, the present invention is not limited to such a mode, under any of the aspects described subsequently.

[0050] A mixer of a carbon-based source of the type: petroleum coke/sand (of which the percentage of silica SiO₂ is greater than 95%) is produced under the standard conditions for a person skilled in the art. The examples which follow were carried out using a Brazilian petroleum coke from the company Petrobras resulting from the distillation of oil in which the EHWC is measured at 4%.

[0051] The petroleum coke is precalcined under temperature conditions and for a time that is sufficient to enable the reduction of its elemental hydrogen weight content (EHWC). The EHWC is measured within the meaning of the present invention according to the standard ISO TS 12902.

[0052] This step of reducing the hydrogen content may, for example, be obtained by a controlled heat treatment of the coke in an electric furnace, under an inert atmosphere.

[0053] In particular, according to the tests carried out in the laboratory under such conditions, the heat treatments may result, without substantial energy expenditure, in a reduction of the EHWC by a factor of greater than 100. By way of example, a final EHWC of around 0.03% was measured fol-

lowing a heat treatment comprising a hold at a maximum temperature of 1350° C. of less than 30 minutes and of around 0.06% following a heat treatment at 1200° C. for two hours of the petroleum coke provided by the company Petrobras.

[0054] According to another possible mode, the tests carried out by the applicant showed that EHWCs of less than 0.1%, or even of less than 0.05% may also be obtained for samples treated in a fired furnace between 1250° C. and 1350° C., small losses of fixed carbon being observed at the same time (from 1% to 5% on the dry product depending on the operating conditions). In order to do this the oxygen partial pressure in the calcination atmosphere must be as low as possible, typically less than 5% of the total pressure of the gases and preferably less than 1%, or even less than 0.7% of the total pressure of the gases.

[0055] Very particularly, it is preferred according to the invention to use a fired rotary furnace in order to carry out the industrial calcination of the coke, under the conditions cited previously.

[0056] The aforementioned calcination cycles include residence times of the coke at the maximum temperature hold generally of less than one hour, in particular of the order of 20 minutes to one hour.

[0057] The thus dehydrogenated coke, optionally stripped of the largest particles (>1 cm in diameter) beforehand (by passing through a hammer mill for example), is then mixed with the source of silicon as described previously.

[0058] The whole assembly is introduced into the SiC reactor, for example an Acheson type furnace incorporating an electrical resistor that is 1.6 meters long but is modified in order to adapt it to the mixture according to the present invention. In particular, the resistivity of the system is consequently modified, by adjusting the dimensions of the central resistor (that is to say reduction of the cross section and of the length).

[0059] In particular, the applicant company observed that the step of removing hydrogen by the supplementary step described previously, with respect to an Acheson process carried out conventionally, leads to a significant drop in the resistivity of the carbon-based source, in particular of the coke.

[0060] In particular, since the resistivity of the calcined coke is very substantially decreased relative to that measured from the crude coke, the tests carried out within the context of the present invention have shown that the equivalent resistance of the complete furnace could be lowered by a factor which may range up to two under the conditions of the tests carried out. The geometry of the central resistor heating the reaction mixture (in general graphite) can therefore be adapted in order to adapt it to the specificities of the electric transformer of the Acheson furnace by playing, for example, with its cross section and/or optionally its length.

[0061] The calcined coke may take up atmospheric moisture depending on its conditions of transportation and storage between the calcination furnace and the Acheson furnace. This moisture does not introduce a significant change in the effects mentioned above nor in the contents (given for dried matter) mentioned.

[0062] The process is otherwise carried out conventionally.

[0063] The invention and its advantages will be better understood on reading the examples that follow.

**BEFORE THE NATIONAL GREEN TRIBUNAL SOUTHERN BENCH
CHENNAI**

APPLICATION NO. 39 OF 2024 (SZ)

IN THE MATTER OF:

Mr. JONATT JOSE

....Applicant

Versus

The Secretary, MoEF&CC and others

....Respondents

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Signed and verified on this 18th day of April, 2024 at Bengaluru

DEPONENT

J. Chandra Babu
REGIONAL DIRECTOR
CENTRAL POLLUTION CONTROL BOARD
REGIONAL DIRECTORATE - BENGALURU
(MIN. OF ENV, FOREST & CC, GOVT OF INDIA)
BENGALURU - 560 079. MOB: 9868278903

**COUNSEL FOR
2nd RESPONDENT**



BEFORE THE NATIONAL GREEN TRIBUNAL SOUTHERN BENCH
CHENNAI

APPLICATION NO. 39 OF 2024 (SZ)

IN THE MATTER OF:

Mr. JONATT JOSE

....Applicant

Versus

The Secretary, MoEF&CC and others

....Respondents

**REPLY ON BEHALF OF THE RESPONDENT NO. 2, THE CENTRAL
POLLUTION CONTROL BOARD (CPCB)**

I, J. Chandra Babu, Son of Late Sh. J. Balaramaiah, aged about 55 years, having office at the Regional Directorate, Central Pollution Control Board, 1st & 2nd Floors, Nisarga Bhavan, A-Block, Thimmaiah Main Road, 7th D Cross, Shivanagar, Bengaluru - 560079, Karnataka do hereby sincerely state as follows:

1. That I, in capacity of Scientist 'E' & Regional Director, Regional Directorate (South), Central Pollution Control Board (hereinafter referred to as CPCB), Bengaluru, have made myself acquainted with the facts and circumstances of the instant case due to the official capacity as mentioned above and on the basis of available records, I am well versed with the facts and circumstances of the matter and as such competent & authorized to file this reply on behalf of Respondent No. 2.



J. Chandra Babu
18/6/2024
J. Chandra Babu
REGIONAL DIRECTOR
CENTRAL POLLUTION CONTROL BOARD
REGIONAL DIRECTORATE - BENGALURU
(MIN. OF ENV. FOREST & CC, GOVT OF INDIA)
BENGALURU - 560 079. MOB: 9868278903

2. That in the said application, applicant is aggrieved due to the pollution caused from M/s Carborundum Universal Ltd, Nalukettu P O, Thrissur District, Kerala because of use of petroleum coke (hereafter referred to as "pet coke") for manufacturing of silicon carbide.

3. That, Hon'ble Supreme Court of India in WP(C) No. 13029/1985 in the matter of "MC Mehta Vs Union of India" has passed the undermentioned orders regarding banning / permitting use of pet coke (in **NCR States**):

- a. Order dated 24.10.2017 (banning use of pet coke and FO)
- b. Order dated 17. 11.2017 (requesting other States/UT to consider taking similar measures)
- c. Order dated 13.12.2017 (permitting use of pet coke in cement kilns and lime kilns and allowing one-year time to power plants to switch over from FO to LDO)
- d. Order dated 05.02.2018 (permitting use of pet coke in calcium carbide units)

4. That, in compliance to Hon'ble Supreme Court orders in WP (C) No. 13029/1985 in the matter of M.C. Mehta Vs Union of India; CPCB vide letter dated 15th November, 2017 issued direction to the Chief Secretaries of Uttar Pradesh, Rajasthan and Haryana under section 5 of the Environment (Protection) Act, 1986 regarding prohibition on use of pet coke and furnace oil by the industry, operation and processes in the respective States with immediate effect. A copy of the direction dated-15th November, 2017 is enclosed at **Annexure- I**.



J. Chandra Babu
18/11/2017

J. Chandra Babu
REGIONAL DIRECTOR
CENTRAL POLLUTION CONTROL BOARD
REGIONAL DIRECTORATE - BENGALURU
(MIN. OF ENV, FOREST & CC, GOVT OF INDIA)
BENGALURU - 560 079. MOB: 9868278903

- State Government/Union Territory Administration through respective SPCB/PCC shall take strict action against any industry if found violating the fuel policy on use of petcoke and FO that will be enforced as above, using the powers conferred under environmental laws.
7. That, the directions to NCR States were issued by this respondent No.2 i.e., CPCB in compliance of Honourable Supreme Court order. The orders of Hon'ble Supreme Court regarding NCR States also included suggestions for other States to adopt similar policies. Subsequent orders of Hon'ble Supreme Court for areas outside NCR were regarding use of imported pet coke. Directions to all states were issued in compliance of Hon'ble National Green Tribunal PB New Delhi order.

8. That, the Kerala State Pollution Control Board vide letter dated 12th March, 2024 sought clarification from CPCB regarding utilization of pet coke as raw material in the manufacture of silicon carbide. Subsequently, CPCB vide letters dated 22nd March, 2024 and 5th April 2024 replied, informing about two sets of Hon'ble Supreme Court orders for NCR States and entire country, respectively, as well as related directions of CPCB. It was also informed to Kerala PCB that the matter be examined based upon the assessment of certain facts, as detailed in the letter dated 05.04.24. Copies of Kerala State PCB letter and CPCB reply letters are attached as **Annexure III, Annexure IV and Annexure V** respectively.




J. Chandra Babu
REGIONAL DIRECTOR
CENTRAL POLLUTION CONTROL BOARD
REGIONAL DIRECTORATE - BENGALURU
(MIN.OF ENV,FOREST & CC, GOVT OF INDIA)
BENGALURU - 560 079. MOB: 9868278903

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL SOUTHERN
ZONE, CHENNAI

Application no. OA 39 of 2024 (SZ)

Applicant(s) : Sri. Jonatt Jose,
S/o Sri. Jose, Nalukettu, Koratty
Vs.
Respondents : The Secretary, MoEF and CC & others

REPORT FILED BY THE 6TH RESPONDENT
ENVIRONMENTAL ENGINEER, DISTRICT OFFICE,
THRISSUR, ON BEHALF OF THE 3RD RESPONDENT
CHAIRPERSON, KERALA STATE POLLUTION CONTROL
BOARD, THIRUVANANTHAPURAM

1. It is respectfully submitted that I am authorized to represent the third respondent in this application. Copy of the authorization letter is produced herewith and marked as **Annexure R6(a)**.
2. Carborundum Universal Ltd., located in Koratty Grama Panchayat, has been operating since 1985. The unit has received the Board's "Integrated Consent to Operate" from 04/07/2010 and is renewing it from time to time. The unit now has a valid Consent to Operate of the Board upto 30.06.2028. True copy of the Consents to Operate are marked and produced herewith as **Annexure R6(b)**.
3. Two types of production activities are done in the unit, which is manufacturing of **Silicon Carbide macro grains** from raw materials like

Petroleum coke (petcoke) and quartz; as well as production of **Micro Grits** from silicon carbide (product from the silicon carbide macro grains plant) with brown fused alumina grains, white fused alumina grains and special ceramics which are brought from outside.

4. For manufacturing of silicon carbide macro grains, raw materials used are petroleum coke and quartz. Company officials informed that petroleum coke is purchased from companies like Bharath Petroleum Corporation Limited. The raw materials are delivered to the furnace plant room from the storage chamber through enclosed ducts. For carrying out the process, 9 furnaces are accommodated in furnace plant room. In each furnace, petcoke and quartz are mixed and kept as a pile. A graphite tube is inserted in between the pile and it is heated to high temperature using electricity to form big lumps of silicon carbide.

In the same building, these lumps are then cooled, crushed and sieved to form various sizes. These sieves are provided with bag filters to prevent dust pollution. Of the 9 furnaces, at normal conditions, 3 will be on firing and 3 in cooling and 3 under construction/ unloading stage. Water sprays are used in cooling and the same is done by providing an iron pipe with holes along it. The sprays will be open for 5 minutes and will be stopped for another 2.5 minutes. During inspection water-spraying was done and there is no sudden release of huge smoke or fume during the spraying.

5. In the Micro Grits production plant, alumina grains, special ceramics and silicon carbide are powdered and then air classified. This process is carried out in a completely enclosed room with bag filters as air pollution control measures. Also, this micro grit plant is located not in the building in which the furnaces are operated but in a separate building.
6. Complaints of the petitioner were received in the office of the sixth respondent against the air pollution from the industry. Upon receiving a complaint from Sri. Jonatt Jose, inspection was conducted by officials of

the Board on 02.05.2023. It was informed by complainants and his family members during the complaint enquiry that due to emissions and odour emitted from the company, the complainant and his family including his small child is suffering from unrelenting cough. They also complained that apart from the air pollution affecting residents, transformers, electric post and household materials like grills, iron pipes, and metallic underside of the cars were prone to rusting quickly. He also added that, as there are no chimneys to vent the emissions from the furnace, the smoke and odour spreads in the premises, especially during cooling thus causing difficulties to the families residing nearby. During inspection conducted in the unit on the same day, fumes containing dust particles or smoke were not seen rising from the reaction furnace in the production of Silicon carbide macro grains. In furnace plant, water is used only for cooling. Also, there is no water consumption in Micro grit plant. Chimneys with air pollution control measures are provided in the raw material handling area and in the crushing plant. There are no separate chimneys to expel the fumes produced from the furnaces.

7. There are not many changes or product variations in the company since 2010 as reported by the management. To assess the effects of air pollution from the industry in the area, Ambient air quality monitoring was done in the unit on 14.02.2022, 2.06.2023 and 08.08.2023. In all these monitoring, Sulphur dioxide (SO_2) and Oxides of Nitrogen (NO_x) were within the limit of National Ambient Air Quality Standards. The alleged air pollution is primarily from the use of petcoke which should have reflected in the results of sulphur dioxide in the ambient air but the standards of sulphur dioxide were not exceeded on each of the days of measurement. Still, In light of existing complaints, the company was asked by the Board to submit a time bound proposal for installing additional control measures. The unit submitted the proposal on 27.11.2023. The proposal includes (i) installing a continuous ambient air quality monitoring system in the premises and (ii) installing hood with

chimney system for the furnaces. Based on this proposal and as the ambient air quality standards were found complied in Board's monitoring, as explained in paragraph 6, the consent to operate of the unit was renewed on 9.01.2024 up to 30.06.2028. Hence the unit possesses valid consent to operate. A copy of the valid consent is marked and produced herewith as **Annexure R6(c)**. In the Consent to Operate, the following specific condition have been added to minimize pollution from the unit.

- i) Ordinary coke shall be used instead of Pet coke.
- ii) Stack with adequate stack height shall be provided to keep the emission quality to the standards.
- iii) Waste water generated shall be properly treated the standard prescribed before disposal.

8. The unit has submitted a letter dated 12.02.2024 to the Board stating that stack for the furnace will be installed within 6 months' time period. The industry also reports that petcoke is not used as fuel in the industry but it is a raw material which gets absorbed in production of silicon carbide. The unit then requested that since pet coke is the raw material used for production of silicon carbide they may be allowed to use petcoke itself with air pollution control measures as proposed to be installed. True copy of the letter dated 12.02.2024 is marked and produced herewith as **Annexures R6(d)**.
9. The other matters raised in the petition are
 - (i) Regarding the fuel policy of the state of Kerala and whether petcoke can be allowed to be used as a raw material or feedstock for silicon carbide manufacture, and,
 - (ii) Regarding the orders of the Hon'ble Supreme Court and Hon'ble National Green Tribunal (Principal Bench) in the matter of petcoke and its interpretation in the case of the industrial activity of this particular industry.

10. Central Pollution Control Board (CPCB) has been addressed vide letter dated 12-3-2024 to give advice on whether petcoke can be used as raw material in manufacture of silicon carbide; and on the control measures to be prescribed.

11. It is humbly submitted that the matter of fuel policy is under the consideration of Government of Kerala. It is also humbly submitted that allowing the use of petcoke in silicon carbide manufacture can be decided after receiving advice from Central Pollution Control Board. Hence it is further submitted that detailed report incorporating these points will be submitted before the next hearing.

Dated this the 12th day of March, 2024



A handwritten signature in blue ink, appearing to read "Suchitra V.", written over a horizontal line.

DEPONENT

SUCHITRA V.
Environmental Engineer

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150 Member Secretary: 2318151
 e-mail: chu.kspcb@gov.in; ms.kspcb@gov.in FAX: 2318152 web: kspcb.kerala.gov.in



KERALA STATE POLLUTION CONTROL BOARD

കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്

Pattom P.O., Thiruvananthapuram – 695 004

പട്ടം പി.ഒ., തിരുവനന്തപുരം - 695 004



KSPCB/1754/2023-SEE-1

Date:11/03/2024

AUTHORISATION

Sub: OA. No.39/2024 filed by Sri. Jonatt Jose before the Hon'ble NGT (SZ)

The Environmental Engineer, District Office, Thrissur is hereby authorized to represent the Chairperson on behalf of the Board in the above O.A.

**For and on behalf of the
 KERALA STATE POLLUTION CONTROL BOARD**


 CHAIRPERSON

To

The Environmental Engineer
 District Office
 Thrissur

Copy to:

1. Adv. Rema Smrithi V.K.
 No.2, Temple Glade Apartments
 Kalakshetra Colony
 Beach Road
 Besant Nagar
 Chennai – 600090
2. The Chief Environmental Engineer
 Regional Office
 Ernakulam
3. The Senior Environmental Engineer
 Legal Cell, Regional Office
 Ernakulam

34/2/2010



KERALA STATE POLLUTION CONTROL BOARD

INTEGRATED CONSENT TO OPERATE/AUTHORISATION

UNDER

The Water (Prevention & Control of Pollution) Act 1974

The Air (Prevention & Control of Pollution) Act 1981

&

The Environment (Protection) Act 1986

To

The Managing Director
Carborandum Universal Limited
P.B. No. 3, Koratty
Thrissur- 680 308

Consent no: PCB/HO/ICO/TSR/09/R1/2010

Date of issue: 04.07.2010

Validity: 30.06.2012

Copy to:

1. The Chief Environmental Engineer
Regional Office, Ernakulam
2. The Environmental Engineer, District Office, Thrissur
3. The Secretary, Koratty Grama Panchayat, Thrissur
4. Stock file

1. GENERAL

1.	VALIDITY	30.06.2012										
2.	Name and address of establishment	CARBORANDUM UNIVERSAL LIMITED Carborandum Universal Limited P.B. No. 3 Koratty 680 308 Thrissur										
3.	Communication	Telephone : 044-2536789- Fax : 044-25340858 e-mail :- Website :-										
4.	Occupier details	Sri. K. Srinivasan Managing Director Carborandum Universal Limited Parry House, 43, Moore Street Chennai – 600 001										
5.	Survey Number	114/1 , 2, 1151/2, 1150/2										
6.	Village	Kizhakkummuri										
7.	Taluk	Mukundapuram										
8.	District	Thrissur										
9.	Local body	Koratty Grama Panchayat										
10.	Category	RED										
11.	Capital Investment	Rs. 30 Crores										
12.	Scale	LARGE										
13.	Annual Fee	Rs. 1,00,000/-										
14.	Fee remitted	Rs. 3,00,000/-										
15.	Water consumption	<table border="1"> <thead> <tr> <th>Purpose</th> <th>Quantity in litre /day</th> </tr> </thead> <tbody> <tr> <td>Cooling, boiler feed</td> <td>5,000</td> </tr> <tr> <td>Domestic</td> <td>5,000</td> </tr> <tr> <td>Irrigation</td> <td>1,000</td> </tr> <tr> <td>TOTAL</td> <td>11,000</td> </tr> </tbody> </table>	Purpose	Quantity in litre /day	Cooling, boiler feed	5,000	Domestic	5,000	Irrigation	1,000	TOTAL	11,000
Purpose	Quantity in litre /day											
Cooling, boiler feed	5,000											
Domestic	5,000											
Irrigation	1,000											
TOTAL	11,000											
16.	PRODUCTS	Silicon carbide macro and micro grit – 250 tonne per month										

2. GENERAL CONDITIONS

- 2.1. This consent is granted subject to the power of the Board to review and make variation in all or any of the conditions.
- 2.2. The applicant shall comply with the instructions that the Board may issue from time to time regarding prevention and control of air, water, land and sound pollution.
- 2.3. For renewal of the consent, application in the prescribed form shall be submitted to the Board in the third month before the date of expiry of the consent.
- 2.4. No change or alteration of the industrial plant is to be made without the prior written permission of the Board. Any change in the particulars furnished and/or in the identity of the occupier/authorised agent is to be intimated to the Board forthwith.

**3. CONDITIONS AS PER
The Water (Prevention & Control of Pollution) Act**

- 3.1. The entire quantity of cooling water shall be recycled.
- 3.2. Sewage effluent shall be treated in septic tanks and treated effluent shall be dispersed through soak pits with concreted bottom, honeycomb brick or perforated ring wall and 75 cm thick 2 mm sand envelope around.
- 3.3. Storm water shall be segregated from effluent.
- 3.4. Rainwater harvesting system shall be maintained properly.
- 3.5. Water meter shall be fixed to record consumption of water. Separate meters shall be fixed if cess at different rates is claimed for use of water for cooling/boiler feed, domestic, process where the effluent is easily biodegradable and / or not toxic and process where the effluent is not easily biodegradable and / or toxic.

**4. CONDITIONS AS PER
The Air (Prevention & Control of Pollution) Act**

- 4.1. Emission shall be made only through the following chimneys and characteristics shall not exceed the following:

Sl. No.	Stack No.	Source of emission	Height & diameter in m	Flow in Nm ³ /hr	Parameter	Limiting standards mg/Nm ³
1.	C1	Reclaims and Quartz dust collector in furnace plant	15 0.608	72,300	Particulate matter	150
2.	C2	Crude crushing dust collector in furnace plant	18 0.475	62,000	"	150
3.	C4	Grain crushing and sizing system in furnace plant	18 0.82	7,700	"	150

- 4.2. The port hole and platform cum ladder attached to stacks shall be maintained to facilitate monitoring of emissions.
- 4.3. There shall not be any fugitive emission from the premises.
- 4.4. The sound level measured 1 m outside the boundary of the premises shall not exceed the standards for the adjacent area.
- 4.5. Record of type, quantity and purpose of consumption of fuel shall be maintained and abstract shall be submitted to the Board along with emission monitoring report.
- 4.6. The suspended particulate matter at the boundary of the premises shall not exceed 200 microgram per cubic metre.

- 4.7. All operations likely to produce dust or noise shall be carried out within sufficiently closed and insulated premises.
- 4.8. The occupier shall install or modify equipments, as necessary, to ensure that the emission /ambient air /sound quality conform to the standards specified in condition no. 4.1 and 4.4.

5. **CONDITIONS AS PER The Hazardous Wastes(Management, Handling and Transboundary Movement) Rules, 2008**

- 5.1. Activities for which Authorisation is granted:

Collection	Storage	Disposal
√	√	√

- 5.2. (i) Type, quantity and mode of storage/collection/treatment/disposal of hazardous wastes shall be as follows:

Sl. No.	Hazardous waste	Schedule Category	Quantity	Mode of	
				Storage	Disposal
1.	Spent Oil	5.1	2500 l/year	Stored in impermeable containers kept in roofed area with impervious flooring and protected from rain and seepage and entry of surface runoff	Dispose to re-refiner/recycler, authorised by the Kerala State Pollution Control Board and registered with the Central Pollution Control Board

- (ii) The location of the hazardous waste storage site shall be made known by display board at the site. The premises of the disposal site shall be kept clean.

5.3. **Labelling and Transportation**

- (a) All hazardous waste containers shall be provided with a general label as given in Form 13.
- (b) Hazardous waste manifest in Form 12 shall be got prepared in set of six (all six copies to be signed by the transporter) and retained/ transported as indicated below:

Copy number with colour code	Purpose
Copy 1 (white)	To be forwarded by the occupier to the Kerala State Pollution Control Board
Copy 2 (yellow)	To be retained by the occupier after taking signature on it from the transporter and the remaining four copies to be carried by the transporter
Copy 3 (pink)	To be retained by the operator of the facility after signature
Copy 4 (orange)	To be returned to the transporter by the operator of facility after accepting waste
Copy 5 (green)	To be returned by the operator of the facility to Kerala State Pollution Control Board after treatment and disposal of wastes
Copy 6 (blue)	To be returned by the operator of the facility to the occupier after treatment and disposal of wastes

- c) Any accident during the collection and transport of hazardous waste shall be reported forthwith to the Head and District Office of the Board at Thrissur by telephone / fax / telegram and also in Form 14.
- d) The occupier shall provide the transporter with relevant information in Form 11, regarding the hazardous nature of the wastes and measures to be taken in case of an emergency.
- e) The occupier shall ensure that at the time of auction or sale of waste, the period of validity of certificate of registration of the registered re-refiner or recycler is sufficient to reprocess the quantity of wastes being sold or auctioned to him.

- 5.4. Records of hazardous wastes at the facility shall be maintained in Form 3.
- 5.5. The guidelines and criteria for handling hazardous wastes prescribed by the Central Pollution Control Board from time to time shall be followed.
- 5.6. The Authorisation is subject to conditions as may be specified in the Rules from time to time under the Environment (Protection) Act, 1986.
- 5.7. Any unauthorised change in personnel, equipment and working conditions as mentioned in the application by the person authorised shall constitute a breach of this authorisation.
- 5.8. It is the duty of the authorised person to take prior permission of the State Pollution Control Board to close down the facility.
- 5.9. The person authorised shall not rent, lend, sell or transfer the hazardous wastes without obtaining prior permission of the Board.
- 5.10. All the facility personnel must be well informed about the hazardous waste management procedure relevant to the positions in which they are employed. All the facility personnel must be trained to ensure that they are able to respond effectively to emergencies by familiarizing them with the emergency procedures, emergency equipment operations and communication or alarm systems.
- 5.11. Facilities must be established, tested periodically and maintained to minimize the possibility of a fire, explosion or any unplanned sudden or non-sudden release of hazardous waste to air, soil or surface water which could threaten human health or environment.
- 5.12. The authorisee must develop, implement and maintain and keep upto date, a contingency plan designed to minimize hazard to human health or the environment from fires, explosions or any unplanned sudden release of hazardous waste to air, soil or water.

6. OTHER CONDITIONS:

- 6.1. Used lead acid batteries shall be disposed as per the Batteries (Management and Handling) Rules 2001.
- 6.2. Arrangements for collection, segregation, storage, handling and disposal of solid wastes including garbage from canteen shall be maintained properly.
- 6.3. Periodical reports as detailed below shall be submitted to the Head Office and Regional Office/ District Surveillance Centre of the Board at Ernakulam:

Sl No.	Reports to be submitted to the Board	Periodicity
1	Effluent and storm water analysis report	Before the 10 th of every month
2	Water Consumption Returns in Form I	Before 5 th of every month
3	Emission monitoring report	Before the 10 th of every month
4	Annual returns of HW handled in Form 4	Annually before 30 th June
5	Hazardous waste manifest in Form 13	During transportation
6	Environment Statement in Form V	Annually by 30 th September



Date: 04.07.2010

Office Seal

SIGNATURE AND NAME OF
ISSUING AUTHORITY

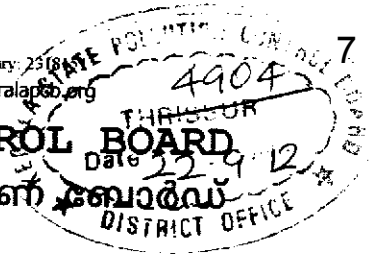
P. MOLIKUTTY
C.E.E. in full additional charge of
MEMBER SECRETARY



KERALA STATE POLLUTION CONTROL BOARD

കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്

Pattom P.O., Thiruvananthapuram – 695 004
പട്ടം പി.ഒ., തിരുവനന്തപുരം - 695 004



File. No. PCB/HO/TSR/ICO/81/2007

Date: 14.09.2012

CONSENT TO OPERATE – RENEWAL

Consent no. PCB /HO/TSR/ICO-R1/ 03/2012

- Ref: 1. Your application dated 31.03,2012
- 2. Consent No PCB/HO/TSR/ICO/09/R1/2010 dated 04.07.2010

The 'Consent to Operate' issued vide ref. 2 to industry (Carborandom Universal Limited, P.B no – 3, Koratty, Thrissur – 680308) is hereby renewed up to 30.06.2015. The copy of consent cited under ref. 2 attached herewith is part of this renewal order and this order is subject to the conditions stipulated therein with the following variations/modifications.

Additions/modifications

1.1 Validity	30.06.2015
1.3 Communication.	Tel: 044-42216789 0480- 2732313 Fax: 0480 2732821
1.4 Occupier details	Sri.A.R Satheesh, General Manager
1.11 Capital Investment	Rs. 32.32469 Crore
1.15 Water consumption	1,50,000 l/day
1.16 Products	Silicon carbide macro grains – 27t/d Silicon carbide micro grits Brown fused Alumina micro grits White fused Alumina micro grits Special ceramic micro grits } 15t/d
1.17 Date of application	31.03.12
1.18 Date of enquiry	16.05.12

176
22-9-12

Other conditions

6.4. Arrangements shall be provided for safe management and disposal of e-waste. The following details shall be submitted to the Board on or before 30.12.2012

Particulars of E-waste	Quantity of E-waste disposed in 2011	Quantity of E-waste proposed to be disposed in 2012	Mode of disposal

6.5 Adequate fire protection equipment in accordance with the fire safety regulations shall be established / installed at salient places and for ensuring the same, necessary certificate from Fire & Rescue Services Department regarding fire safety shall be obtained. The unit shall have valid certificate from the Fire & Rescue Services Department during its operation.

6.6 Sign Board of size 6x4 ft shall be erected outside the main gate of the unit displaying important consent conditions, the latest ambient air and noise monitoring data against the standards specified and the relevant information about hazardous wastes both in English & Malayalam.



For and on behalf of the
KERALA STATE POLLUTION CONTROL BOARD


(MEMBER SECRETARY)

To

Sri. A.R Satheesh,
General Manager
Carborandom Universal Limited,
P.B no – 3, Thrissur – 680308

Copy to:

1. The Chief Environmental Engineer, Regional Office, Ernakulam
- ✓ 2. The Environmental Engineer, District Office, Thrissur
3. Stock file



KERALA STATE POLLUTION CONTROL BOARD

FILE NO. :PCB/HO/TSR/ICO/81/2007

Date of issue :08/08/2015

INTEGRATED CONSENT TO OPERATE - RENEWAL

Consent No : PCB/HO/TSR/ICO-R/10/2015

Ref : Consent No PCB/HO/TSR/ICO-R1/03/2012 dated 14.09.2012

The 'Integrated Consent to Operate' issued as per reference above to M/s Carborandum Universal Ltd, P.B.No-3, Koratty, Thrissur-680308 is hereby renewed up to 30/06/2018 and issued to M/s Carborandum Universal Ltd, P.B.No-3, Koratty, Thrissur-680308. The consent(s)/ variation order(s) cited under reference are integral part of this renewal order and this order is subject to the conditions stipulated therein and the following modifications/ additions.

I. GENERAL

S.No.	Items	Description
1	Validity	30.06.2018
2	Capital Investment	Rs 33. 60 Crores
3	Date of Application	07.07.2015
4	Date of enquiry	27.05.2015

II. CONDITIONS

1. Condition 6.5 is modified as: Adequate fire safety measures shall be installed in accordance with fire safety regulations.

All other conditions of the Integrated Consent to Operate issued as per reference above remain unchanged.

DATE :08/08/2015



OFFICE SEAL

SIGNATURE & SEAL OF ISSUING AUTHORITY

MEMBER SECRETARY

Copy To

1. The Environmental Engineer, District Office, Thrissur
2. Stock file



KERALA STATE POLLUTION CONTROL BOARD

FILE NO. :PCB/HO/TSR/ICO/81/2007

Date of issue :16/07/2018

INTEGRATED CONSENT TO OPERATE - RENEWAL

Consent No : PCB/HO/TSR/ICO-R/11/2018

Valid upto 30/06/2023

Ref : 1.Consent No:PCB/HO/TSR/ICO-R/10/2015 dated 08/08/2015 Valid upto 30/06/2023

The ' Integrated Consent to Operate' issued as per reference above to M/s CARBORUNDUM UNIVERSAL LIMITED,PB.NO.3,NALUKETTU P.O,KORATTY,THRISSUR-680308, is hereby renewed up to 30/06/2023 and issued to M/s CARBORUNDUM UNIVERSAL LIMITED,PB.NO.3,NALUKETTU P.O,KORATTY,THRISSUR-680308. The consent(s)/ variation order(s) cited under reference are integral part of this renewal order and this order is subject to the conditions stipulated therein and the following modifications/ additions.

I. GENERAL

S.No.	Items	Description
1	Validity	30/06/2023
2	Annual Fee	Rs.1,44,000/-
3	Capital Investment	Rs.3390.38 Lakhs
4	Fee Remitted	Rs.7,33,500/-(for 5 years)
5	Category	Red
6	Raw material	Petroleum Coke-20 M T/d Silicon carbide crude 10 MT/d Quartz -24 M T/d
7	Product	Silicon carbide macro grains -27 M T/d Micro grits of SiC and special ceramics -15 MT/d
8	Raw material	Grains of Silicon Carbide, Brown fused Alumina, White fused Alumina ,Special ceramic (total) -16 M T/d

II. Stack Details

Stack No.	Source of Emission	Emission Rate(Nm ³ /Hr)	Stack Height above		Control Equipment
			Ground Level(In Meters)	Roof Level(In Meters)	

As per the previous consent					
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III. CONDITIONS

1. Fee and arrears as per notification no.G.O(P)No.2/2017/Env. dated 04.11.2017 shall be remitted to the Board on receipt of this consent.

All other conditions of the Integrated Consent to Operate issued as per reference above remain unchanged.

DATE :16/07/2018

SIGNATURE & SEAL OF ISSUING AUTHORITY
MEMBER SECRETARY



To

M/s CARBORUNDUM UNIVERSAL LIMITED,
PB.NO.3,NALUKETTU P.O,
KORATTY,THRISSUR-680308

1. This digitally signed document is legally valid as per the Information Technology Act 2000

2. For verifying this document please go to krocmms.nic.in and search using date of issue/name of the unit/Application Number in "Consent Granted Applications" link in the home page of the Board's Online Consent Management and Monitoring System.



KERALA STATE POLLUTION CONTROL BOARD

FILE NO. : KSPCB/TS/ICO/10041755/2024

Date of issue : 09-01-2024

INTEGRATED CONSENT TO OPERATE - RENEWAL

Consent No : KSPCB/TS/ICO/10041755/2023

Valid upto : 30 / 06 / 2028

Ref:

1. Consent no PCB/HO/TSR/ICO-R/11/2018 dated 16.07.2018 valid up to 30.06.2023
2. Your application dated 21.06.2023

The Integrated Consent to Operate issued as per reference above is hereby modified & issued to M/s CARBORUNDUM UNIVERSAL LIMITED , PB.NO.3,NALUKETTU P.O,KORATTY.

The consent(s)/ variation order(s) cited under reference are integral part of this consent variation order and this order is subject to the conditions stipulated therein and the following modifications/ additions.

1. GENERAL

S No.	Items	Description
1	Raw material	Raw petroleum coke – 20 TPD Quartz – 24 TPD Silicon carbide grains, brown fused alumina grains, white fused alumina grains, special ceramic grains – 25 TPD Silicon carbide crude – 20 TPD
2	Product	Silicon carbide macro grains – 40 TPD Microgrits of SiC and special ceramics – 24 TPD
3	Annual fee	Rs 1,50,000/-
4	Fee remitted (For 5 years)	Rs 7,65,833/- (Rs 29,333/- arrear fee and Rs 13,500/- excess from previous

		renewal application)
5	Capital investment (in Lakhs)	Rs 3521
6	Validity	30.06.2028

2. CONDITIONS

2.1 For renewal of the consent in case of continuance of operation of the industry, application in the prescribed form shall be submitted through the web portal of the Board (www.keralapcbonline.com) for renewing the Consent on or before two months in advance to expiry date. Late application will be accepted with 10% (for application before expiry date) & 50% of yearly fee as late fee for application after due date. The renewal application in the prescribed form shall be submitted through the web portal of the Board.

2.2 The applicant shall comply with the instructions that the Board may issue from time to time regarding prevention and control of air, water, land and sound pollution.

2.3 No change or alteration of the unit/establishment is to be made without the prior written permission of the Board. Any change in the particulars furnished and/or in the identity of the occupier/authorized agent is to be intimated to the Board forthwith.

2.4 This consent is granted based on the particulars and affidavit submitted by the Entrepreneur and any violation/non-compliance/submission of false information will lead to cancellation of consent and stringent action against the applicant and occupier.

2.5 This consent is granted subjected to the power of the Board to review and make variations in all or any of the conditions as per section 21 (6) of the Air Act 1981 and Section 27 of Water Act 1974.

2.6 Ordinary coke shall be used instead of Pet coke.

2.7 Stack with adequate stack height shall be provided to keep the emission quality to the standards.

2.8 Waste water generated shall be properly treated the standards prescribed before disposal.

All other conditions of the Integrated Consent to Operate issued as per reference above remain unchanged.

Digitally signed by SHEELA A M
Date: 2024.01.09 23:24:36 IST

SIGNATURE OF ISSUING AUTHORITY

MEMBER SECRETARY

To

M/s CARBORUNDUM UNIVERSAL LIMITED
PB.NO.3,NALUKETTU P.O,KORATTY
E-Mail : Kuruvillarajeshj@cumi.murugappa.com
Contact Number :9645238258,

- 1.This digitally signed document is legally valid as per the Information Technology Act 2000
2. For verifying this document please go to www.keralapcbonline.com and search using Certificate Number/Name of the unit/Application Number in “Certificate Verification” link in the home page of the Board’s Phoenix website.

THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

Annexure – 5

No. 14 of 1981

[29th March, 1981]

An Act to provide for the prevention, control and abatement of air pollution, for the establishment, with a view to carrying out the aforesaid purposes, of Boards, for conferring on and assigning to such Boards powers and functions relating thereto and for matters connected therewith.

WHEREAS decisions were taken at the United Nations Conference on the Human Environment held in Stockholm in June, 1972, in which India participated, to take appropriate steps for the preservation of the natural resources of the earth which, among other things, include the preservation of the quality of air and control of air pollution;

AND WHEREAS it is considered necessary to implement the decisions aforesaid in so far as they relate to the preservation of the quality of air and control of air pollution;

BE it enacted by Parliament in the Thirty-second Year of the Republic of India as follows :-

CHAPTER I PRELIMINARY

1. Short title, extent and commencement.

(1) This Act may be called the Air (Prevention and Control of Pollution) Act, 1981.

(2) It extends to the whole of India.

(3) It shall come into force on such date¹ as the Central Government may, by notification in the Official Gazette, appoint.

2. Definitions.

In this Act, unless the context otherwise requires,-

(a) "air pollutant" means any solid, liquid or gaseous substance² [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment;

(b) "air pollution" means the presence in the atmosphere of any air

(c) "approved appliances" means any equipment or gadget used for the bringing of any combustible material or for generating or consuming any fume, gas or particulate matter and approved by the State Board for the purpose of this Act;

(d) "approved fuel" means any fuel approved by the State Board for the purposes of this Act;

(e) "automobile" means any vehicle powered either by internal combustion engine or by any method of generating power to drive such vehicle by burning fuel;

(f) "Board" means the Central Board or State Board;

(g) "Central Board" means the³ [Central Board for the Prevention and Control of Water Pollution] constituted under section 3 of the Water (Prevention and Control of Pollution) Act, 1974;

(h) "chimney" includes any structure with an opening or outlet from or through which any air pollutant may be emitted,

(i) "control equipment" means any apparatus, device, equipment or system to control the quality and manner of emission of any air pollutant and includes any device used for securing the efficient operation of any industrial plant;

(j) "emission" means any solid or liquid or gaseous substance coming out of any chimney, duct or flue or any other outlet;

(k) "industrial plant" means any plant used for any industrial or trade purposes and emitting any air pollutant into the atmosphere;

(l) "member" means a member of the Central Board or a State Board, as the case may be, and includes the Chairman thereof,

4[(m) "occupier", in relation to any factory or premises, means the person who has control over the affairs of the factory or the premises, and includes, in relation to any substance, the person in possession of the substance;]

(n) "prescribed" means prescribed by rules made under this Act by the Central Government or as the case may be, the State government;

(o) "State Board" means,-

(i) in relation to a State in which the Water (Prevention and Control of Pollution) Act, 1974, is in force and the State Government has constituted for that State a⁵[State Board for the Prevention and Control of Water Pollution] under section 4 of that Act, the said State Board; and

(ii) in relation to any other State, the State Board for the Prevention and Control of Air Pollution constituted by the State Government under section 5 of this Act.

CHAPTER II

CENTRAL AND STATE BOARDS FOR THE PREVENTION AND CONTROL OF AIR POLLUTION

6[3. Central Board for the Prevention and Control of Air Pollution.

The Central Board for the Prevention and Control of Water Pollution constituted under section 3 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), shall, without prejudice to the exercise and performance of its powers and functions under this Act, exercise the powers and perform the functions of the Central Board for the Prevention and Control of Air Pollution under this Act.

7[4. State Boards for the Prevention and Control of Water Pollution to be, State Boards for the Prevention and Control of Air Pollution.

In any State in which the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), is in force and the State Government has constituted for that State a State Board for the Prevention and Control of Water Pollution under section 4 of that Act, such State Board shall be deemed to be the State Board for the Prevention and Control of air Pollution constituted under section 5 of this Act and accordingly that State Board for the Prevention and Control of Water Pollution shall, without prejudice to the exercise and performance of its powers and functions under that Act, exercise the powers and perform the functions of the State Board for the Prevention and Control of Air Pollution under this Act.]

5. Constitution of State Boards.

(1) In any State in which the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), is not in force, or that Act is in force but the State Government has not constituted a⁸[State Board for the Prevention and Control of Water Pollution] under that Act, the State Government shall, with effect from such date as it may, by notification in the Official Gazette, appoint, constitute a State Board for the Prevention and Control of Air Pollution under such name as may be specified in the notification, to exercise the powers conferred on, and perform the functions assigned to, that Board under this Act.

(2) A State Board constituted under this Act shall consist of the following members, namely:-

(a) a Chairman, being a person, having a person having special knowledge or practical experience in respect of matters relating to environmental protection, to be nominated by the State Government:

Provided that the Chairman may be either whole-time or part-time as the State Government may think fit;

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(b) such number of officials, not exceeding five, as the State Government may think fit, to be nominated by the State Government to represent that government;

(c) such number of persons, not exceeding five, as the State Government may think fit, to be nominated by the State Government from amongst the members of the local authorities functioning within the State;

(d) such number of non-officials, not exceeding three, as the State Government may think fit, to be nominated by the State Government to represent the interest of agriculture, fishery or industry or trade or labour or any other interest, which in the opinion of that government, ought to be represented;

(e) two persons to represent the companies or corporations owned, controlled or managed by the State Government, to be nominated by that Government;

9[(f) a full-time member-secretary having such qualifications knowledge and experience of scientific, engineering or management aspects of pollution control as may be prescribed, to be appointed by the State Governments

Provided that the State Government shall ensure that not less than two of the members are persons having special knowledge or practical experience in, respect of matters relating to the improvement of the quality of air or the prevention, control or abatement of air pollution.

(3) Every State Board constituted under this Act shall be a body corporate with the name specified by the State Government in the notification issued under sub-section (1), having perpetual succession and a common seal with power, subject to the provisions of this Act, to acquire and dispose of property and to contract, and may by the said name sue or be sued.

6. Central Board to exercise the powers and perform die functions of a State Board in the Union territories.

No State Board shall be constituted for a Union territory and in relation to -a Union territory, the Central Board shall exercise the powers and perform the functions of a State Board under this Act for that Union territory

Provided that in relation to any Union territory the Central Board may delegate all or any of its powers and functions under this section to such person or body of persons as the Central Government may specify.

7. Terms and conditions of service of members.

(1) Save as otherwise provided by or under this Act, a member of a State Board constituted under this Act, other than the member-secretary, shall hold office for a term of three years from the date on which his nomination is notified in the Official Gazette:

Provided that a member shall, notwithstanding the expiration of his term, continue to hold office until his successor enters upon his office.

(2) The terms of office of a member of a State Board constituted under this Act and nominated under clause (b) or clause (e) of sub-section (2) of section 5 shall come to an end as soon as he ceases to hold the office under the State Government as the case may be, the company or corporation owned, controlled or managed by the State Government, by virtue of which he was nominated.

(3) A member of a State Board constituted under this Act, other than the member- secretary, may at any time resign his office by writing under his hand addressed,-

(a) in the case of the Chairman, to the State Government; and

(b) in any other case, to the Chairman of the State Board, and the seat of be Chairman or such other member shall thereupon become vacant.

(4) A member of a State Board constituted under this Act, other than the member-secretary, shall be deemed to have vacated his scat, if he is absent without reason, sufficient in the opinion of the State Board, from three consecutive meetings of the State Board or where he is nominated under clause (c) of subsection (2) of section 5, he ceases to be a member of the local authority and such vacation of scat shall, in either case, take effect from such as the State Government may, by notification in the Official Gazette, specify.

(5) A casual vacancy in a State Board constituted under this Act shall be filled by a fresh nomination and the person nominated to fill the vacancy shall hold office only for the remainder of die term for which the member whose place lie takes was nominated.

(6) A member of a State Board constituted under this Act shall be eligible for re-nomination ^{10*****}

(7) The other terms and conditions of service of the Chairman and other members (except the member-secretary) of a State Board constituted under this Act shall be such as may be prescribed.

8. Disqualifications.

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(1) No person shall be a member of a State Board constituted under this

(a) is, or at any time has been, adjudged insolvent, or

(b) is of unsound mind and has been so declared by a competent court,

(c) is, or has been, convicted of an offence which, in the opinion of the State Government, involves moral turpitude, or

(d) is, or at any time has been, convicted of an offence under this Act,

(e) has directly or indirectly by himself or by any partner, any share or interest in any firm or company carrying on the business of manufacture, sale, or hire of machinery, industrial plant, control equipment or any other apparatus for the improvement of the quality of air or for the prevention, control or abatement of air pollution, or

(f) is a director or a secretary, manager or other salaried officer or employee of any company or firm having any contract with the Board, or with the Government constituting the Board or with a local authority in the State, or with a company or corporation owned, controlled or managed by the Government, for the carrying out of programmes for the improvement of the quality of air or for the prevention, control or abatement of air pollution, or

(g) has so abused, in the opinion of the State Government, his position as a member, as to render his continuance on the State Board detrimental to the interest of the general public.

(2) The State Government shall, by order in writing, remove any member who is, or has become, subject to any disqualification mentioned in sub-section M.

Provided that no order of removal shall be made by the State Government under this section unless the member concerned has been given a reasonable opportunity of showing cause against the same.

(3) Notwithstanding anything contained in sub-section (1) or sub-section (6) of section 7, a member who has been removed under this section shall not be eligible to continue to hold office until his successor enters upon his office, or, as the case may be, for re-nomination as a member.

9. Vacation of seats by members.

If a member of a State Board constituted under this Act becomes subject to any of the disqualifications specified in section 8, his seat shall become vacant.

10. Meetings-of Board.

(1) For the purposes of this Act, a Board shall meet at least once in every three months and shall observe such rules of procedure in regard to the transaction of business at its meetings as may be prescribed:

Provided that it, in the opinion of the Chairman, any business of an urgent nature is to be transacted, he may convene a meeting of the Board at such time as he thinks fit for the aforesaid purpose.

(2) Copies of minutes of the meetings under sub-section (1) shall be forwarded to the Central Board and to the State Government concerned.

11. Constitution -of committees.

(1) A Board may constitute as many committees consisting wholly of members or partly of members and partly of other persons and for such purpose or purposes as it may think fit.

(2) A committee constituted under this section shall meet at such time and at such place, and shall observe such rules of procedure in regard to the transaction of business at its meetings, as may be prescribed.

(3) The members of a committee other than the members of the Board shall be paid such fees and allowances, for attending its meetings and for attending to any other work of the Board as may be prescribed.

12. Temporary association of persons with Board for particular purposes.

(1) A Board may associate with itself in such manner, and for such purposes, as may be prescribed, any person whose assistance or advice it may desire to obtain in performing any of its functions under this Act.

(2) A person associated with the Board under sub-section (1) for any purpose shall have a right to take part in the discussions of the Board relevant to that purpose, but shall not have a right to vote at a meetings of the Board and shall not be a member of the Board for any other purpose.

(3) A person associated with a Board under sub-section (1) shall be entitled to receive such fees and allowances as may be prescribed.

13. Vacancy in Board not to invalidate acts or proceedings.

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No act or proceeding of a Board or any committee thereof shall be called in question on the ground merely of the existence of any vacancy in or any defect in the constitution of, the Board or such committee, as the case may be.

14. Member-secretary and officers and other employees of State Boards.

(1) The terms and conditions of service of the member-secretary of a State Board constituted under this Act shall be such as may be prescribed.

11[(2) The member-secretary of a State Board, whether constituted under this Act or not, shall exercise such powers and perform such duties as may be prescribed or as may, from time to time, be delegated to him by the State Board or its Chairman.]

(3) subject to such rules as may be made by the State Government in this behalf, a State Board, whether constituted under this Act or not, may appoint such officers and other employees as it considers necessary for the efficient performance of its functions under this Act.

(4) The method of appointment, the conditions of service and the scale of pay of the officers (other than the member-secretary) and other employees of a State Board appointed under sub-section (3) shall be such as may be determined by regulations made by the State Board under this Act.

(5) Subject to such conditions as may be prescribed, a State Board constituted under this Act may from time to time appoint any qualified person to be a consultant to the Board and pay him such salary and allowances or fees, as it thinks fit.

15. Delegation of powers

A State Board may, by general or special order, delegate to the Chairman or the member-secretary or any other officer of the Board subject to such conditions and limitations, if any, as may be specified in the order, such of its powers and functions under this Act as it may deem necessary.

CHAPTER III POWERS AND FUNCTIONS OF BOARDS

16. Functions of Central Board.

(1) Subject to the provisions of this Act, and without prejudice to the performance, of its functions under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), the main functions of the Central Board shall be to improve the quality of air and to prevent, control or abate air pollution in the country.

(2) In particular and without prejudice to the generality of the foregoing functions, the Central Board may-

(a) advise the Central Government on any matter concerning the improvement of the quality of air and the prevention, control or abatement of air pollution;

(b) plan and cause to be executed a nation-wide programme for the prevention, control or abatement of air pollution;

(c) co-ordinate the activities of the State and resolve disputes among them;

(d) provide technical assistance and guidance to the State Boards, carry out and sponsor investigations and research relating to problems of air pollution and prevention, control or abatement of air pollution;

12[(dd) perform such of the function of any State Board as may, be specified in and order made under sub-section (2) of section 18;]

(e) plan and organise the training of persons engaged or to be engaged in programmes for the prevention, control or abatement of air pollution on such terms and conditions as the Central Board may specify;

(f) organise through mass media a comprehensive programme regarding the prevention, control or abatement of air pollution;

(g) collect, compile and publish technical and statistical data relating to air pollution and the measures devised for its effective prevention, control or abatement and prepare manuals, codes or guides relating to prevention, control or abatement of air pollution;

(h) lay down standards for the quality of air.,

(i) collect and disseminate information in respect of matters relating to air pollution;

(j) perform such other functions as may be prescribed.

(3) The Central Board may establish or recognise a laboratory or laboratories to enable the Central Board to perform its functions

under this section efficiently.

(4) The Central Board may-

- (a) delegate any of its functions under this Act generally or specially to any of the committees appointed by it;
- (b) do such other things and perform such other acts as it may think necessary for the proper discharge of its functions and generally for the purpose of carrying into effect the purposes Of this Act.

17. Functions of State Boards.

(1) subject to the provisions of this Act, and without prejudice to the performance of its functions, if any, under the Water (Prevention and Control of Pollution) Act, 1974 (Act 6 of 1974), the functions of a State Board shall be-

- (a) to plan a comprehensive programme for the prevention, control or abatement of air pollution and to secure the execution thereof;
- (b) to advise the State Government on any matter concerning the prevention, control or abatement of air pollution;
- (c) to collect and disseminate information relating to air pollution;
- (d) to collaborate with the Central Board in organising the training of persons engaged or to be engaged in programmes relating to prevention, control or abatement of air pollution and to organise mass-education programme relating thereto;
- (e) to inspect, at all reasonable times, any control equipment, industrial plant or manufacturing process and to give, by order, such directions to such persons as it may consider necessary to take steps for the prevention, control or abatement of air pollution;
- (f) to inspect air pollution control areas at such intervals as it may think necessary, assess the quality of air therein and take steps for the prevention, control or abatement of air pollution in such areas;
- (g) to lay down, in consultation with the Central Board and having regard to the standards for the quality of air laid down by the Central Board, standards for emission of air pollutants into the atmosphere from industrial plants and automobiles or for the discharge of any air pollutant into the atmosphere from any other source whatsoever not being a ship or an aircraft:
Provided that different standards for emission may be laid down under this clause for different industrial plants having regard to the quantity and composition of emission of air pollutants into the atmosphere from such industrial plants;
- (h) to advise the State Government with respect to the suitability of any premises or location for carrying on any industry which is likely to cause air pollution;
- (i) to Perform such other functions as may be prescribed or as may, from time to time, be entrusted to it by the Central Board or the State Government;
- (j) to do such other things and to perform such other acts as it may think necessary for the proper discharge of its functions and generally for the purpose of carrying into effect the purposes of this Act.

(2) A State Board may establish or recognise a laboratory or laboratories to enable the State Board to perform its functions under this section efficiently.

18. Power to give directions.

¹³[(1)] In the performance of its functions under this Act-

- (a) the Central Board shall be bound by such directions in writing as the Central Government may give to it; and
- (b) every State Board shall be bound by such directions in writing as the Central Board or the State Government may give to it:

Provided that where a direction given by the State Government is inconsistent with the direction given by the Central Board, the matter shall be referred to the Central Government for its decision.

14[(2)] Where the Central Government is of the opinion that any State Board has defaulted in complying with any directions given by the Central Board under sub-section (1) and as a result of such default a grave emergency has arisen and it is necessary or expedient so to do in the public interest, it may, by order, direct the Central Board to perform any of the functions of the State Board in relation to such area, for such period and for such purposes, as may be specified in the order.

(3) Where the Central Board performs any of the functions of the State Board in pursuance of a direction under sub-section (2), the expenses, if any incurred by the Central Board with respect to the performance of such functions may, if the State Board is empowered to recover such expenses, be recovered by the Central Board with interest (at such reasonable rate as the Central Government may, by order, fix) from the date when a demand for such expenses is made until it is paid from the person or persons concerned as arrears of land revenue or of public demand.

(4) For the removal of doubts, it is hereby declared that any directions to perform the functions of any State Board given under sub-section (2) in

respect of any area would not preclude the State Board from performing such functions in any other area in the State or any of its other functions in that area.]

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CHAPTER IV PREVENTION AND CONTROL OF AIR POLLUTION

19. Power to declare air pollution control areas,

(1) The State Government may, after consultation with the State Board, by notification in the Official Gazette declare in such manner as may be prescribed, any area or areas within the State as air pollution control area or areas for the purposes of this Act.

(2) The State government may, after consultation with the State Board, by notification in the Official Gazette,-

(a) alter any air pollution control area whether by way of extension or reduction ;

(b) declare a new air pollution control area in which may be merged one or more existing air pollution control areas or any part or parts thereof.

(3) If the State Government, after consultation with the State Board, is of opinion that the use of any fuel, other than an approved fuel, in any air pollution control area or part thereof, may cause or is likely to cause air pollution, it may, by notification in the Official Gazette, prohibit the use of such fuel in such area or part thereof with effect from such date (being not less than three months from the date of publication of the notification) as may be specified in the notification.

(4) The State Government may, after consultation with the State Board, by notification in the Official Gazette, direct that with effect from such date as may be specified therein, no appliance, other than an approved appliance, shall be used in the premises situated in an air pollution control area :

Provided that different dates may be specified for different parts of an air pollution control area or for the use of different appliances.

(5) If the State Government, after consultation with the State Board, is of opinion that the burning of any material (not being fuel) in any air pollution control area or part thereof may cause or is likely to cause air pollution, it may, by notification in the Official Gazette, prohibit the burning of such material in such area or part thereof.

20. Power to give instructions for ensuring standards for emission from automobiles.

With a view to ensuring that the standards for emission of air pollutants from automobiles laid down by the State Board under clause (g) of sub-section (1) of section 17 are complied with, the State Government shall, in consultation with the State Board, give such instructions as may be deemed necessary to the concerned authority in charge of registration of motor vehicles under the Motor Vehicles Act, 1939 (Act 4 of 1939), and such authority shall, notwithstanding anything contained in that Act or the rules made thereunder be bound to comply with such instructions.

21. Restrictions on use of certain industrial plants.

¹⁵[(/) Subject to the provisions of this section, no person shall, without the previous consent of the State Board, establish or operate any industrial plant in an air pollution control area :

Provided that a person operating any industrial plant in any air pollution control area, immediately before the commencement of section 9 of the Air (Prevention and Control of Pollution) Amendment Act, 1987, for which no consent was necessary prior to such commencement, may continue to do so for a period of three months from such commencement or, if he has made an application for such consent within the said period of three months, till the disposal of such application.]

(2) An application for consent of the State Board under sub-section (1) shall be accompanied by such fees as may be prescribed and shall be made in the prescribed form and shall contain the particulars of the industrial plant and such other particulars as may be prescribed :

Provided that where any person, immediately before the declaration of any area as an air pollution control area, operates in such area any industrial plant, ¹⁶*** such person shall make the application under this sub-section within such period (being not less than three months from the date of such declaration) as may be prescribed and where such person makes such application, he shall be deemed to be operating such industrial plant with the consent of the State Board until the consent applied for has been refused,

(3) The State Board may make such inquiry as it may deem fit in respect of the application for consent referred to in sub-section (1) and in making any such inquiry, shall follow such procedure as may be prescribed.

(4) Within a period of four months after the receipt of the application for consent referred to in sub-section (1), the State Board shall, by order in writing, ¹⁷[and for reasons to be recorded in the order, grant the consent applied for subject to such conditions and for such period as may be specified in the order, or refuse consent:]

¹⁸[Provided that it shall be open to the State Board to cancel such consent before the expiry of the period for which it is granted or refuse further consent after such expiry if the conditions subject to which such consent has been granted are not fulfilled:

Provided further that before cancelling a consent or refusing a further consent under the first provision, a reasonable opportunity of being heard shall be given to the person concerned.]

(5) Every person to whom consent has been granted by the State Board under sub-section (4), shall comply with the following conditions, namely -

(i) the control equipment of such specifications as the State Board may approve in this behalf shall be installed and operated in the premises where the industry is carried on or proposed to be carried on;

(ii) the existing control equipment, if any, shall be altered or replaced in accordance with the directions of the State Board;

(iii) the control equipment referred to in clause (i) or clause (ii) shall be kept at all times in good running condition;

(iv) chimney, wherever necessary, of such specifications as the State Board may approve in this behalf shall be erected or re-erected in such premises; and

(v) such other conditions as the State Board, may specify in this behalf,

(vi) the conditions referred to in clauses (i), (ii) and (iv) shall be complied with within such period as the State Board may specify in this behalf-

Provided that in the case of a person operating any industrial plant^{19***} in an air pollution control area immediately before the date of declaration of such area as an air pollution control area, the period so specified shall not be less than six months :

Provided further that-

(a) after the installation of any control equipment in accordance with the specifications under clause (i), or

(b) after the alteration or replacement of any control equipment in accordance with the directions of the State Board under clause (ii), or

(c) after the erection or re-erection of any chimney under clause (iv), no control equipment or chimney shall be altered or replaced or, as the case may be, erected or re-created except with the previous approval of the State Board.

(6) If due to any technological improvement or otherwise the State Board is of opinion that all or any of the conditions referred to in sub-section (5) require or requires variation (including the change of any control equipment, either in whole or in part), the State Board shall, after giving the person to whom consent has been granted an opportunity of being heard, vary all or any of such conditions and thereupon such person shall be bound to comply with the conditions as so varied.

(7) Where a person to whom consent has been granted by the State Board under sub-section (4) transfers his interest in the industry to any other person, such consent shall be deemed to have been granted to such other person and he shall be bound to comply with all the conditions subject to which it was granted as if the consent was granted to him originally.

22. Persons carrying on industry, etc., and to allow emission of air pollutants in excess of the standard laid down by State Board.

No person^{20****} operating any industrial plant, in any air pollution control area shall discharge or cause or permit to be discharged the emission of any air pollutant in excess of the standards laid down by the State Board under clause (g) of sub-section (1) of section 17.

21[22A. Power of Board to make application to court for restraining person from causing air pollution.

(1) Where it is apprehended by a Board that emission of any air pollutant, in excess of the standards laid down by the State Board under clause (g) of sub-section (1) of section 17, is likely to occur by reason of any person operating an industrial plant or otherwise in any air pollution control area, the Board may make an application to a court, not inferior to that of a Metropolitan Magistrate or a Judicial Magistrate of the first class for restraining such person from emitting such air pollutant.

(2) On receipt of the application under sub-section (1), the court may make such order as it deems fit.

(3) Where under sub-section (2), the court makes an order restraining any person from discharging or causing or permitting to be discharged the emission of any air pollutant, it may, in that order,-

(a) direct such person to desist from taking such action as is likely to cause emission;

(b) authorise the Board, if the direction under clause (a) is not complied with by the person to whom such direction is issued, to implement the direction in such manner as may be specified by the court.

(4) All expenses incurred by the Board in implementing the directions of the court under clause (b) of sub-section (3) shall be recoverable from the person concerned as arrears of land revenue or of public demand.

23. Furnishing of information to State Board and other agencies in certain cases.

(1) Where in any^{22***} area the emission of any air pollutant into the atmosphere in excess of the standards laid down by the State Board occurs or is apprehended to occur due to accident or other unforeseen act or event, the person in charge of the premises from where which emission occurs or is apprehended to occur shall forthwith intimate the fact of such occurrence or the apprehension of such occurrence to the State Board and to such authorities or agencies as may be prescribed.

(2) On receipt of information with respect to the fact or the apprehension of any occurrence of the nature referred to in sub-section (1), whether through intimation under that sub-section or otherwise, the State Board and the authorities or agencies shall, as early as practicable, cause such remedial measure to be taken as are necessary to mitigate the emission of such air pollutants.

(3) Expenses, if any, incurred by the State Board, authority or agency with respect to the remedial measures referred to in sub-section (2) together with interest ("at such reasonable rate, as the State Government may, by order, fix) from the date when a demand for the expenses is made until it is paid, may be recovered by that Board, authority or agency from the person concerned, as arrears of land revenue, or of public demand.

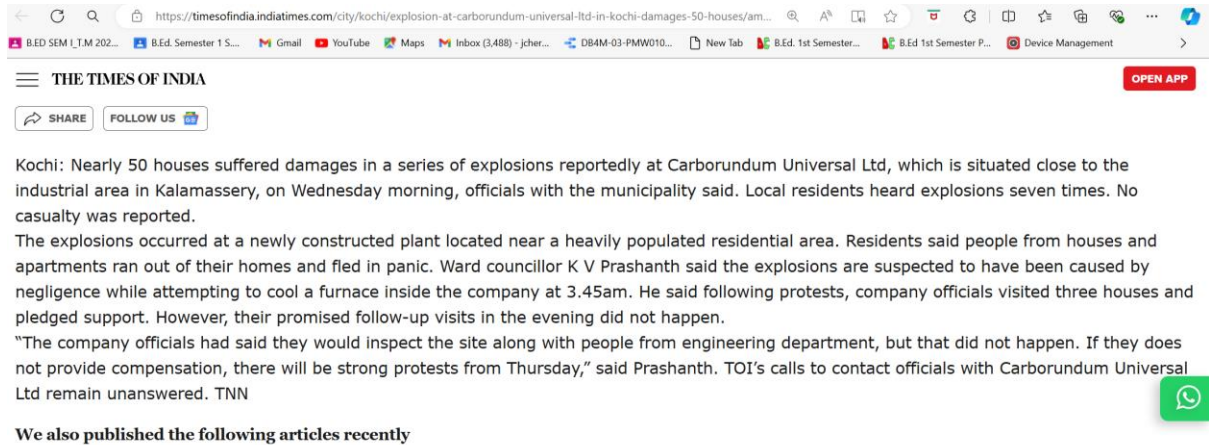
24. Power of entry and inspection.

(1) Subject to the provisions of this section, any person empowered by a State Board in this behalf shall have a right to enter, at all reasonable times with such assistance as he considers necessary, any place—

(a) for the purpose of performing any of the functions of the State Board entrusted to him :

(b) for the purpose of determining whether and if so in what manner, any such functions are to be performed or whether any provisions of this Act or the rules made thereunder or any notice, order, direction or authorisation served, made, given or granted under this Act is being or has been complied with;

(c) for the purpose of examining and testing any control equipment, industrial plant, record, register, document or any other material object or for conducting a search of any place in which he has reason to believe that an offence under this Act or the rules made has been or is being or is about to be committed and for seizing any such control equipment, industrial plant, record, register, document or other material object if he has reasons to believe that it may furnish evidence of the commission of an offence punishable under this Act or the rules made thereunder.



The screenshot shows a web browser displaying a news article from The Times of India. The browser's address bar shows the URL: <https://timesofindia.indiatimes.com/city/kochi/explosion-at-carborundum-universal-ltd-in-kochi-damages-50-houses/am...>. The page header includes the logo for 'THE TIMES OF INDIA' and an 'OPEN APP' button. Below the header are 'SHARE' and 'FOLLOW US' buttons. The main text of the article reads: 'Kochi: Nearly 50 houses suffered damages in a series of explosions reportedly at Carborundum Universal Ltd, which is situated close to the industrial area in Kalamassery, on Wednesday morning, officials with the municipality said. Local residents heard explosions seven times. No casualty was reported. The explosions occurred at a newly constructed plant located near a heavily populated residential area. Residents said people from houses and apartments ran out of their homes and fled in panic. Ward councillor K V Prashanth said the explosions are suspected to have been caused by negligence while attempting to cool a furnace inside the company at 3.45am. He said following protests, company officials visited three houses and pledged support. However, their promised follow-up visits in the evening did not happen. "The company officials had said they would inspect the site along with people from engineering department, but that did not happen. If they does not provide compensation, there will be strong protests from Thursday," said Prashanth. TOI's calls to contact officials with Carborundum Universal Ltd remain unanswered. TNN'. A WhatsApp icon is visible in the bottom right corner of the article content.

We also published the following articles recently

Petcoke, or petroleum coke, is indeed burned as a fuel in the manufacturing of silicon carbide (SiC).

It serves as both a feedstock and a source of heat in the production process. The high carbon content of petcoke, which can exceed 90%, makes it an effective fuel for generating the necessary temperatures in industrial furnaces used for SiC synthesis.

Role of Petcoke in Silicon Carbide Manufacturing

***Fuel Source In the silicon carbide production process, petcoke is typically mixed with silica sand and subjected to high temperatures (between 2100°C and 2700°C) in a furnace. The combustion of petcoke provides the heat required for the endothermic reactions that convert silica (SiO₂) and carbon (C) into silicon carbide (SiC) through the following primary reaction:



This reaction highlights that petcoke not only acts as a carbon source but also contributes to the thermal energy needed for the reaction to occur

.***Energy Efficiency The use of petcoke is advantageous due to its high energy content and low sulfur levels, especially when compared to other carbon sources. The energy produced from burning petcoke significantly contributes to maintaining the high temperatures necessary for efficient SiC production. In many cases, the ratio of silica to petcoke is approximately 1:1, ensuring that there is sufficient carbon available for the reaction while also optimizing thermal efficiency within the furnace

Conclusion

Given its role in providing both heat and carbon for chemical reactions, petcoke can be classified as a fuel in the context of silicon carbide manufacturing. Its combustion generates the required thermal energy, making it integral to the production process. Therefore, it is accurate to refer to petcoke as a fuel in this industrial application.

Reference <https://www.perplexity.ai/search/is-petcoke-is-burned-as-a-fuel-jGagUnSEQi.kGBmkycD4w> as on 7th December 2024



A Novel, Low-Cost Sustainable Process to Produce Silicon Carbide

Silicon carbide (SiC) is a versatile non-oxide ceramic that has gained considerable interest for a range of applications. Its unique physical and chemical properties include relatively low thermal expansion, high force-to-weight ratio, high thermal conductivity, hardness, resistance to abrasion and corrosion, and most importantly, sustained elastic resistance at temperatures up to 1,650°C. These properties have led to its use as an advanced ceramic component for the defense, steel manufacturing, chemical, aerospace, and automotive industries. In addition, its electrical properties, in combination with its mechanical and thermal properties, make it an excellent semiconductor for high-voltage and high-temperature power electronic systems, such as electric vehicle powertrains and 5G power transmitters.

SiC is conventionally produced via the Acheson process, invented in 1893. The Acheson process reacts petroleum coke and high-purity crystalline silica (quartz SiO₂) in an open-atmosphere 30-kA electrical resistance furnace. This manufacturing process produces toxic gases (predominantly SO_x, NO_x, and CO) and releases heavy metal particles that present environmental and health risks. Further, the SiC ingot product requires additional processing,

including chemical purification and grinding to a particle size of 1–10 μm; the processing and handling of these particles have been reported to cause respiratory damage and lung cancer.

Due to these emissions and safety risks, the U.S. produces only about 4% of the global demand for SiC. Yet SiC is a critical material for the production of components and devices used in U.S. national security, semiconductor, and clean energy technologies. With the U.S. SiC market expected to increase from \$200 million in 2020 to over \$600 million in 2030, developing an innovative and efficient SiC production process that reduces environmental emissions and safety risks and allows for domestic manufacturing is necessary to meet the growing demand for this critical material.

While working on producing hydrogen from methane pyrolysis, researchers at Susteon, a small business in North Carolina's Research Triangle, serendipitously discovered that Si powder works effectively as a catalyst to convert methane into high-purity hydrogen. Their initial hypothesis was that carbon released during the methane pyrolysis step is deposited on the Si particle and can be recovered by chemical/mechanical means. However, the analysis of solid particles found

that the SiC phase forms by reaction of Si with carbon under the pyrolysis conditions. This discovery led to funding from the U.S. National Science Foundation (NSF) to develop a process to convert low-cost natural gas and industrial silicon

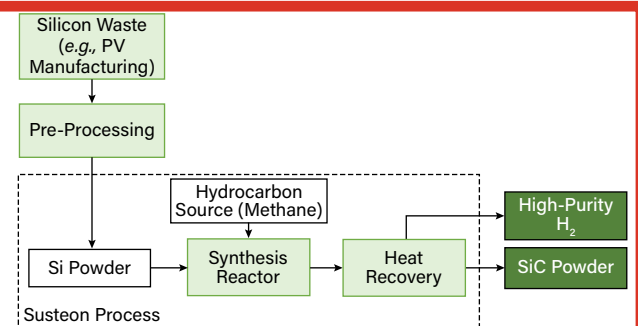
waste powder into a high-purity SiC powder, while producing hydrogen (H₂) as a clean, salable byproduct.

Compared to today's SiC production, Susteon's process has potential to reduce CO₂ emissions by 75% and eliminate the release of toxic SO_x, NO_x, and heavy metals at very low production cost. Once successfully developed, the process can produce a high-purity, microsized green SiC (*i.e.*, β-SiC polytype) for \$10 to \$20 per kg, less than half the cost of the current state-of-the-art technology. The use of recycled waste Si and fugitive methane or biogas can further reduce the cost and greenhouse gas emissions from SiC production.

Susteon has designed and built a bench-scale, proof-of-concept reactor to evaluate the feasibility of the process and generate key process design information, including the reactor operating conditions, to achieve the requisite SiC product purity. A key challenge is to provide controlled heating at scale. The company plans to use this information to design and build a pilot-scale prototype to produce up to 100 kg/day of SiC. Several industrial partners have expressed interest in the SiC produced from this process as it provides a new green pathway for cost-effective and domestic manufacturing of low-emissions SiC.

Rakesh Kapoor, currently a Principal at Materials Outovation and a former Director of Engineered Ceramics at Saint-Gobain, says, "I believe this synthesis route could provide high-purity SiC for high-end ceramics applications at much lower carbon footprint than the classical Acheson process and potentially at lower cost."

This technology was funded through the NSF Small Business Innovation Research Program.



▲ Susteon's silicon carbide synthesis process uses recycled silicon waste material to produce high-purity silicon carbide and hydrogen.

This article was prepared by the National Science Foundation in partnership with CEP.

Full name: Open Joint Stock Company "Volga Abrasive Factory" (JSC "Volzhsky Abrasive Plant") Russia

The Volga Abrasive Plant

OJSC VAZ is one of the most important enterprises in the industry. The main activity of the Volga abrasive plant is deployed in the markets of abrasive tools, grinding materials and refractory products. The technological basis of production is the melting and processing of silicon carbide of black and green own production, used in abrasive, refractory and metallurgical fields. In 2007, OJSC Volga Abrasive Plant became part of the company Karborundum Universal Limited (India). The main activity of the Boardrunum Universal Limited is the production of abrasive tools, molded and unformed refractory and industrial ceramics. Representatives of the company are members of the Board of Directors of OJSC Volzhsky Abrasive Plant.

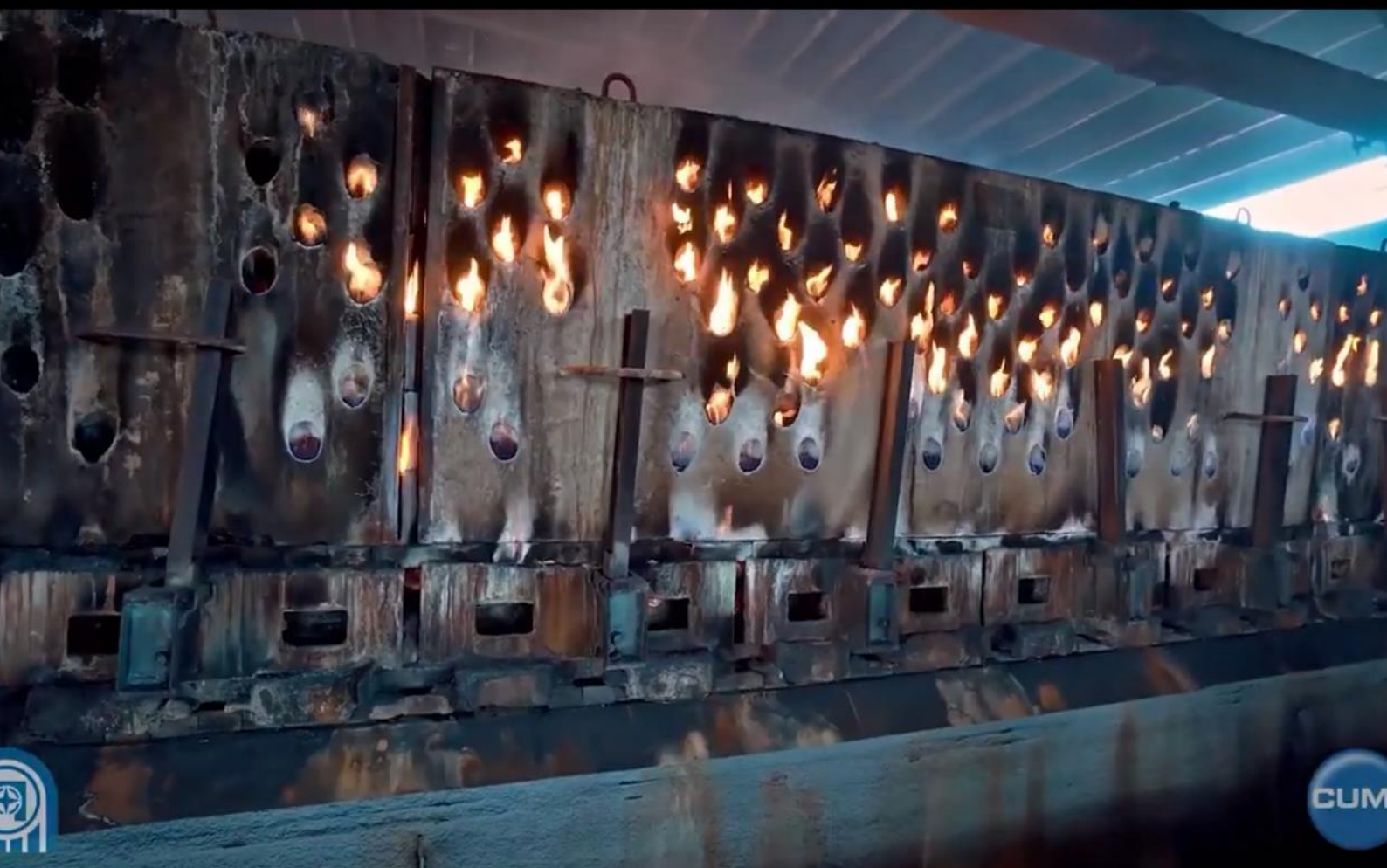
Source : <https://vabz.ru/about/>



**Aerial view of the Volga Abrasive
Factory**



The furnace with hood system



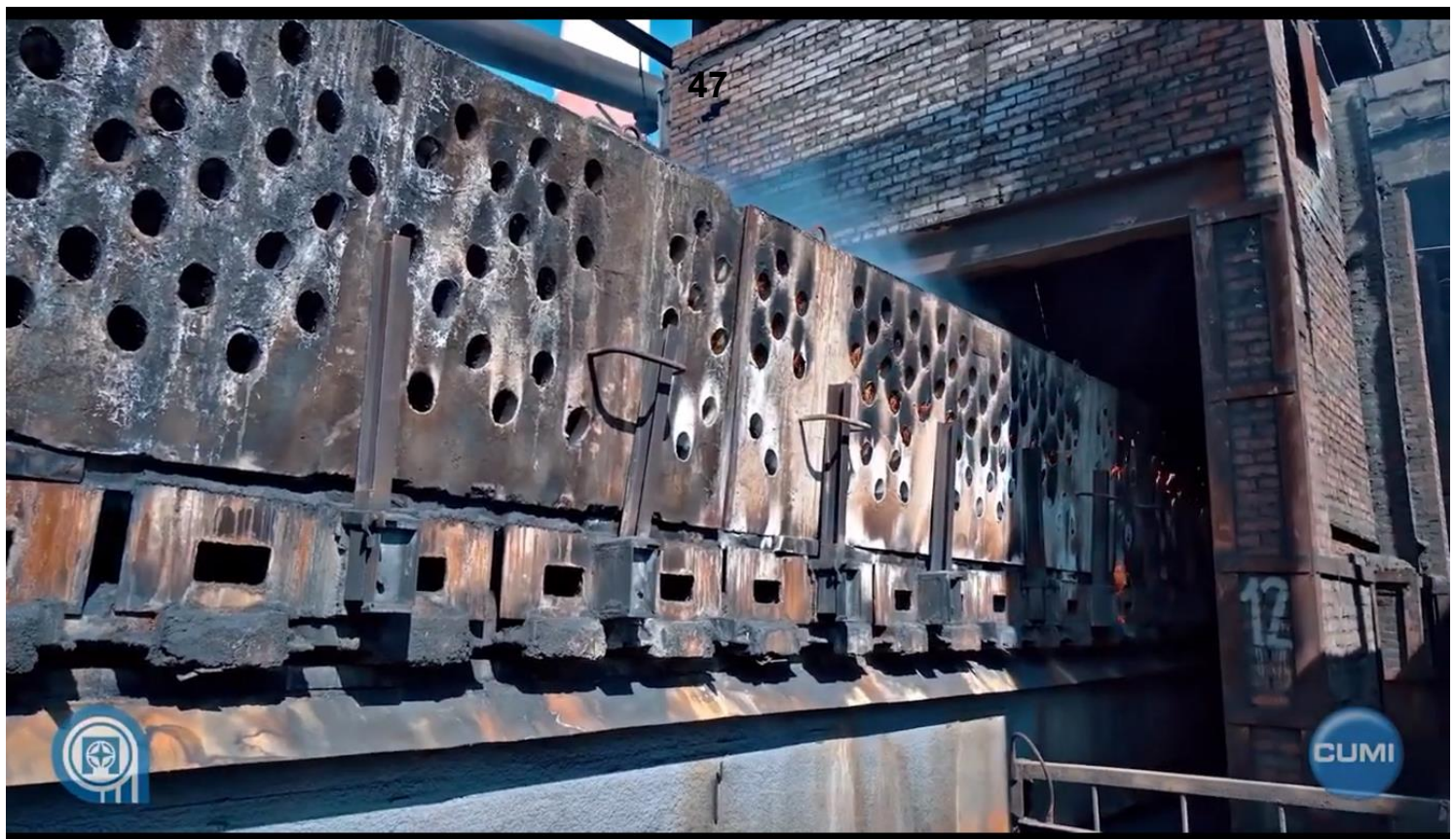
Petcoke is burning in the The Acheson furnace



Petcoke is burning in the The Acheson furnace



The factory has six industrial stacks



Furnace is shifted for cooling



Gases collecting system

Gas Emissions from Thermal Decomposition of Petroleum Coke

When 20 tonnes of petroleum coke undergo thermal decomposition in an Acheson furnace, various gases are emitted as a result of the combustion and chemical reactions involved. Based on typical emission factors for petroleum coke, the following gases and their quantities can be expected:

Gas Emissions from Thermal Decomposition of Petroleum Coke

1. **Carbon Dioxide (CO₂):**

- Quantity: 50 tonnes
- Emission Factor: 2.5 tonnes per tonne of petcoke

2. **Carbon Monoxide (CO):**

- Quantity: 10 tonnes
- Emission Factor: 0.5 tonnes per tonne of petcoke

3. **Volatile Organic Compounds (VOCs):**

- Quantity: 2 tonnes
- Emission Factor: 0.1 tonnes per tonne of petcoke

4. **Hydrogen (H₂):**

- Quantity: 1 tonne
- Emission Factor: 0.05 tonnes per tonne of petcoke

5. **Sulfur Dioxide (SO₂)** (if sulfur is present in the coke):

- Quantity: 0.4 tonnes

- Emission Factor: 0.02 tonnes per tonne of petcoke

These calculations are based on average emission factors typically associated with the thermal decomposition of petroleum coke in industrial processes.

Supporting Documents and Relevant Pages

1. Code Execution Result:

- The emissions were calculated using a Python script that applies standard emission factors to the mass of petroleum coke.
- **Source:** Code execution results from a calculation based on emission factors .

2. Environmental Impact Assessment:

- This document discusses emissions related to the use of petroleum coke in various industrial processes, including the Acheson furnace.
- **Relevant Page:** Specific emissions and their impacts can often be found in environmental assessments or regulatory documents related to industrial emissions.

3. Air Pollution Emissions and Control Technology:

- This report details emissions from various metallurgical processes, including those involving petroleum coke in Acheson furnaces.
- **Relevant Page:** The section discussing emissions from Acheson furnaces typically outlines the types and quantities of gases produced

[5](#)

These documents collectively provide insights into the gas emissions resulting from the thermal decomposition of petroleum coke in an Acheson furnace, confirming the quantities and types of gases emitted during the process.

Reference : <https://www.perplexity.ai/search/is-petcoke-is-burned-as-a-fuel-jGagUnSEQi..kGBmkycD4w#5>

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CRUSHING SCREENING STORAGE SHIPMENT FIGURE 2 FERROALLOY PRODUCTION FLOW DIAGRAM SHOWING...

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PARAMETER	VALUE	UNIT
PM10	34.790	ug/m3
PM2.5	20.420	ug/m3
CO2	424.940	PPM
CO	1.226	mg/m3
TEMP	29.920	oC
SO2	30.983	ug/m3
RLH	86.800	%

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PARAMETER	VALUE	UNIT
PM10	34.790	ug/m3
PM2.5	20.420	ug/m3
CO2	424.940	PPM
CO	1.226	mg/m3
TEMP	29.920	oC
SO2	30.983	ug/m3
RLH	86.800	%



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PARAMETER	VALUE	UNIT
PM10	31.430	ug/m3
PM2.5	14.140	ug/m3
CO2	-1.000	PPM
CO	2.870	mg/m3
TEMP	20.000	°C
S02	62.070	ug/m3
R.H	40.000	%

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PM2.5	7.200	ug/m3
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CO	2.870	mg/m3
TEMP	0.000	°C
S02	194.000	ug/m
R.H	100.000	%



Annexure – 12



PBL Netherlands Environmental
Assessment Agency

DECARBONISATION OPTIONS FOR THE DUTCH SILICON CARBIDE INDUSTRY

C. Xavier, C. Oliveira

29 July 2021



Manufacturing Industry Decarbonisation Data Exchange Network

2 Silicon carbide production process

Silicon carbide (SiC) only occurs in nature as the mineral moissanite, found in the meteorite iron of Canon Diablo in Arizona, in the US. Other than that, it has to be manufactured, and its production dates back to the end of the 19th century when Acheson developed a method of reacting clay and coke in a resistance furnace while trying to produce diamonds. As a result, this process had little crystals of silicon carbide crusted in the electrodes, being the first register of non-natural silicon carbide production. The current manufacturing method for the abrasives, metallurgical, and refractory industries is the same as the one developed by Acheson, but in a bigger scale.

Silicon carbide is produced under high-temperature via an electrochemical reaction between silica sand (quartz) and petroleum coke with a low sulphur composition, specially selected for its purity and particle size. The chemical process today is carried out in batches inside a highly energy-intensive electric resistor furnace (typically 6.2 – 8 MWh or 22-28 GJ per tonne SiC) with a production capacity of around 200 to 500 tonnes of SiC per furnace (European Commission, 2007). The primary overall chemical reaction is:



The industrial process consists of immersing the graphite core in the raw materials and heat it to elevated temperatures (between 2100 and 2700 °C), obtaining different structures of silicon carbide as a product and process gases as a by-product. The simplified industrial production process is shown below in Figure 2:

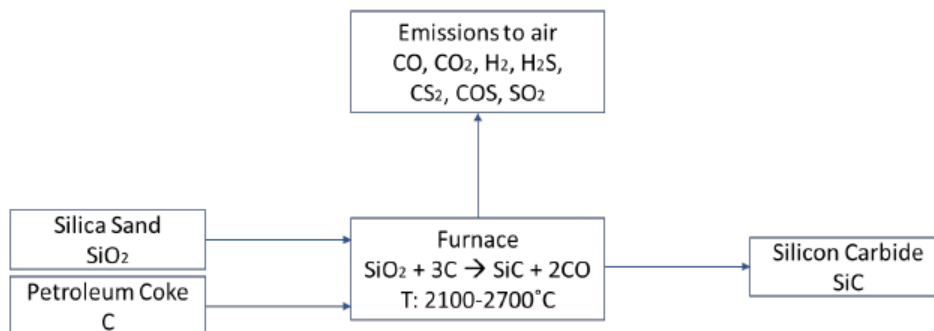


Figure 2 - Simplified diagram of silicon carbide production

improving its energy efficiency. As a result, most heat usable for the reaction will be used. In that way, the type of silicon carbide formed depends on what temperature it was exposed to. The closer to the centre, the more heat, and the more crystalline the SiC is formed. In the same way, the further from the centre, the more amorphous/metallurgical the SiC is. This difference between the SiC formation is shown in Figure 5.



Figure 5 – Different forms of Silicon Carbide produced according to its distance to the graphite core. ESD SIC B.V., Delfzijl (ESD-SIC, 2020)

After this process, the silicon carbide as a final product is already available. It has only to be separated according to its characteristics as crystalline and metallurgical SiC. Every oven produces around 250 tonnes of silicon carbide and 600 tonnes of gases every batch. On the other hand, the gas under the PE foil goes through a common collection system that takes it to the next stages of the process. This gas is rich in hydrogen and carbon monoxide and carbon dioxide and in the ESD-SIC industrial site it is captured under the foil to be used further in the energy recovery plant. More about its composition will be discussed in Section 2.3. At this stage, sometimes also the phenomenon of blow-outs occur, representing a kind of uncontrolled emissions of combusted gas and eventual dust.

2.1.4 Process Gas Desulphurization – PRF Plant

The process gas collected under the PE foil comes from a common system to the desulphurization plant (PRF). This gas consists of circa 1% hydrogen sulphide (H_2S), and its removal is necessary to reduce finally SO_2 emission. The combustion of H_2S (that will be the next stage of the process) could cause problems for the boiler and produce more SO_2 than ESD-SIC has permission to emit, so the captured process gas is purified in the PRF. The so called LoCat process is used to desulphurize the gases, catalytically transforming H_2S into elemental sulphur. As a result, the hydrogen sulphide is more than 99% converted, producing around 1600 tonnes per year of sulphur. Only a small part (10%) of COS and CS_2 remains and will be combusted into SO_2 . Additionally, 75% of organic nitrogen is washed out in the PRF, decreasing the final NO_x emissions at the final stages (Gedeputeerde Staten der Provincie Groningen, 2012). From the desulphurization plant, there are two main output streams, one with degenerated catalytic fluid and the other with the remaining gases of the process. This stream is used as a nutrient in an external saltwater treatment installation.

Technical Support Document for the Silicon Carbide Production Sector: Proposed Rule for Mandatory Reporting of Greenhouse Gases

Office of Air and Radiation
U.S. Environmental Protection Agency

January 22, 2009

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1. Industry Description

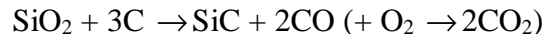
Silicon carbide is primarily an industrial abrasive manufactured from silica sand or quartz and petroleum coke (USGS 2006). Applications of silicon carbide include semiconductors, body armor, and the manufacture of Moissanite, a diamond substitute. The silicon carbide sector discussed in this Technical Support Document is limited to the production of “abrasive-grade” silicon carbide. Approximately 35,000 metric tons of “abrasive-grade” silicon carbide valued at 24.3 million dollars was produced by a single facility in Illinois in 2006. Similarly, 35,000 metric tons of “metallurgical-grade” silicon carbide was produced in 2006 at the same facility (USGS 2006). A small manufacturer in Kentucky is known to produce non-abrasive grade silicon carbide for “heat-resistant products” though the quantity produced is unknown (USGS 2006).

Table 1. U.S. Producers of Silicon Carbide

Company	2006 Silicon Carbide Production (metric tons)	2006 Silicon Carbide Production (million \$)
Exolon Corp.	35,000	24.3

Source: USGS Minerals Yearbook 2006 (<http://minerals.usgs.gov/minerals/pubs/commodity/abrasives/myb1-2006-abras.pdf>)

Silicon carbide is produced through the following reaction:



2. Total Emissions

Silicon carbide process emissions (U.S EPA 2008) totaled 100,226 mtCO₂e in 2006. Of the total, process-related CO₂ emissions accounted for 91% (91,700 mtCO₂e) and CH₄ emissions accounted for 9% (8,526 mtCO₂e). On-site stationary combustion emissions from silicon carbide production amounted to 9,045 mtCO₂e (less than one percent of the total emissions).

2.1 Process Emissions

As shown above, carbon dioxide (CO₂) and methane (CH₄) are emitted during the production of silicon carbide. Petroleum coke is utilized as the carbon source during silicon carbide production. Approximately 35% of the carbon is retained within the silicon carbide, and the remaining carbon is converted to CO₂ and CH₄. The presence of hydrogen-containing volatile compounds in the petroleum coke may cause formation and emission to the atmosphere of CH₄ (IPCC 2006).

2.2 Stationary Combustion

Combustion emissions of GHGs from the production of silicon carbide are limited to the fuel inputs used for equipment necessary to the manufacturing process. The existing silicon carbide plant uses natural gas as the fuel for the product dryer and uses electric furnaces.

3. Review of Existing Programs and Methodologies

Emissions monitoring from the silicon carbide sector are addressed in both the *U.S. Inventory* (U.S. EPA 2008) and *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC 2006). The *U.S. Inventory* relies upon standard emission factors from the IPCC to report CO₂ emissions for the silicon carbide sector whereas the IPCC itself offers three tiers including a reporting method that utilizes facility-specific petroleum coke consumption data (Tier 3). No additional protocols were identified from emission trading schemes, voluntary programs or industry trade groups.

4. Options for Reporting Threshold

4.1 Emissions Thresholds

Four emissions threshold levels were considered for the silicon carbide manufacturing sector based on actual emissions. These thresholds, 100,000, 25,000, 10,000, and 1,000 mtCO₂e per year, were analyzed. All threshold levels were found to incorporate all silicon carbide manufacturing facilities included in this Technical Support Document. Table 2 provides the threshold analysis for the silicon carbide sector. The threshold analysis estimated total emissions for the silicon carbide sector at 109,271 tons CO₂. This total was the additive sum of process emissions (100,226 mtCO₂e) and combustion emissions (9,045 mtCO₂e). The single facility with known production that has been identified would surpass the 100,000 tons CO₂ reporting threshold.

Table 2. Emissions Threshold Analysis for Silicon Carbide Production

Threshold Level (Metric Tons)	Process Emissions (Metric Tons CO ₂ e/yr)	CO ₂ Emissions (Metric Tons/yr)	Total National Emissions (Metric Tons CO ₂ e)	Number of Entities	Emissions Covered		Entities Covered	
					Tons CO ₂ e/yr	Percent	Number	Percent
100,000	100,226	9,045	109,271	1	109,271	100%	1	100%
25,000	100,226	9,045	109,271	1	109,271	100%	1	100%
10,000	100,226	9,045	109,271	1	109,271	100%	1	100%
1,000	100,226	9,045	109,271	1	109,271	100%	1	100%

Process emissions were calculated using default emission factors for both CO₂ and CH₄ per metric ton of silicon carbide produced. The amount of silicon carbide produced is limited, in this analysis, to “abrasive-grade” silicon carbide. The factors, 2.62 metric tons of CO₂ per metric ton of raw material used and 11.6 kg of CH₄ per metric ton of carbide produced, were published by the IPCC and are equivalent to a Tier 1 estimation method (IPCC 2006). Calculations of process emissions followed the equation:

$$E_{CO_2} = [(EF_{CO_2} * AD) + (EF_{CH_4} * AD * 21)]$$

Where:

E_{CO_2}	= Emissions of CO ₂ and CH ₄ , (mtCO ₂ e)
EF_{CO_2}	= Emissions factor for CO ₂
EF_{CH_4}	= Emissions factor for CH ₄
AD	= Silicon carbide production, (metric tons)
21	= Global warming potential for CH ₄ , (mt CO ₂ /mt CH ₄)

Combustion emissions were estimated through data collected from a Title V permit that listed the number, type, and fuel consumption rate of stationary emission sources at the known silicon carbide production facility. Assuming that each emission unit within the facility operated continuously (24-hours a day, 365 days a year) at 90% capacity, emissions were estimated for a solution heater that ran on natural gas and consumed 2.5 MMBtu/hr, and a rotary dryer that ran on natural gas and consumed 19.1 MMBtu/hr (Illinois EPA 2004).

Annexure – 14

Date: 12th August 2024

Place: Nalukettu

From,

Mr. JONETT JOSE, M-A- 38 Years,
S/o. JOSE
Choorackal House, Nalukettu Po,
Nalukettu, Thrissur District,
Pin: 680308
Mob No. 9400165674

To

- 1) Central Pollution Control Board
Parivesh Bhawan,
East Arjun Nagar, Delhi - 110 032
- 2) Kerala State Pollution Control Board
Head Office, Pattom PO,
Thiruvananthapuram, Kerala - 695004.
- 3) Addl. Principal Chief Conservator of Forest (C)
Ministry of Env., Forest and Climate Change
Regional Office (SZ), Kendriya Sadan, 4th Floor, E&F
Wings, 17th Main Road, Koramangala II Block, Bangalore – 560034

Subject (1) Complaint about environmental pollution and (2) absence of the continuous pollution measuring system from an industrial company named Carborundum Universe located in the 6th Ward of Koratty Gram Panchayat of Thrissur District and (3) negligence of the concerned Government departments

Respected Sir/Madam,

This is to bring to your urgent notice concerning human Right violation happening in the 6th ward of Nalukettu, Thrissur District Kerala. The Carborundum Universal Limited was established in the year 1985 which operates in the 6th ward of Nalukettu, Thrissur District 100 meters away from my house. Silicon Carbide is manufactured in this company in a chemical process of fusion and combustion of raw materials such as silica and petroleum coke at 1200 to 2500 degree Celsius for 48 hours and processed thereafter.

- 1) Carborundum Universal Limited has a permission to use Petroleum Coke as feed stock up to 20 tonnes in the production of Silicon Carbide. The elements like arsenic, lead, tin, sulphur, titanium are present in Pet Coke. When it is used in the furnace it produces mass quantity of greenhouse gas emissions such as Hydrogen (H₂), Methane (CH₄), Carbon Monoxide (CO),

Carbon Dioxide (CO₂), Hydrocarbons (C_xH_y), Sulfur Compounds, Nitrogen Compounds etc... It is emitting unbearable smell causing respiratory issues to the neighbourhood.

- 2) The furnace waist has been dumbbed at the side of the road but within the premises of the industrial establishment. It was notified to the representatives from KSPCB from Trissur and Ernakulam. It pollutes the water sources and in turn KSPCB had asked the company authorities to remove them. Till today they have not removed to a safe area, in fact they are covering it with mud. At this juncture rain is accelerating the pollutant elements to get absorbed in the earth and polluting the drinking water.
- 3) Pollution Control Board, Thrissur and Koratty Gram Panchayat has directed Cardamom Universal Ltd to install a real time air quality monitoring system to know the live/continues air quality and notify to the Koratty Gram Panchayat the same with necessary data. The air quality monitoring devise has been removed after 27th of July 2024 from the existing location and no substitute devise has been put in its place. As a matter of fact, the air quality monitoring data is no more collected. As of now the correct data is not displayed. From the second week of August the Display board if switched off. The display of the monitoring devise is not placed visible to the public.
- 4) This drastic action has been taken as result of complaints of local people since it has been polluting the environment and causing health hazards. Public Information Officer & Assistant Environment engineer, Thrissur had visited the houses and their surroundings and were convinced of the problems. After much efforts and complaints, Ambien air quality monitoring system (a continuous pollution measuring system) has been placed in the premise of the factory to monitor the pollution level of the carborundum universal limited.
- 5) **NB:** The pollution level is very high since 2011 ever since they have been using Petcoke and we have been complaining more than last one decade and we don't find any result. Several officers from various departments have come and inspected but till date they have not done any actions. In fact, KSPCB has been giving consent letters to the factory without making it sure whether the factory has followed the conditions for giving the consent letter.

6) Negligence from the Side of Various Concerned Departments; Resulting Pollution and Health Hazards

6.1 Violation of the order from KSPCB (PCB/HO/ICO/TSR/09/R1/2010) and Point of Violation

- a) **Absence of Industrial Stack:** Point 4.1 of the above-mentioned letter states clearly the required industrial stack. Emission shall be only through the following chimney¹. Even today the Carborundum Universal LTD Plant located at Nalukettu doesn't have the Industrial Stack connected to the Furnace and yet they have 9 furnace plants. The nine furnaces are dived into 3-unit batch and all of them work alternatively. **Despite the violation of the conditions by Carborundum Universal limited LTD plant at Nalukettu, KSPCB has given the renewal of the consent. This is a matter of grave concern since the renewal of the consent is given without fulfilling the required conditions.**

¹ Consent no: KSPCB (PCB/HO/ICO/TSR/09/R1/2010) Kerala state pollution control board, 2010 point no 4.1, page 4

- b) **Absence of Effluent plant:** They do not have effluent plant and scrubber system to prevent the air pollution. As a matter of fact, the pollution level is very high. But the company manipulates the date and shows it as under very low emission. **On 9th of August 2024 representatives from KSPCB from Thrissur branch had come and made firsthand examination of the situation and saw the absence of the real time air quality monitoring system and experienced the smell.**
- c) **Fugitive Emission:** There is continuous air pollution and the monitoring system placed in the campus of the company itself has shown the high rate of air pollution with high sulphur emission.
- d) **Absence of Enclosed and insulated Premise for operation of the furnace:** - 2013 consent letter states the conditions to function the furnace and the factory and it has clearly stated that the operations should be done in an insulated manner. *“All operations likely to produce dust or noise shall be carried out within huffingly closed and insulated premises”*²

4.2 FILE NO: KSPCB/TS/ICO/10041755/2024, Date of issue: 09-01-2024

This consent is granted based on the particulars and affidavit submitted by the Entrepreneur and any violation/non-compliance/submission of false information will lead to cancellation of consent and stringent action against the applicant and occupier³.

- a) *“Stack with adequate stack height shall be provided to keep the emission quality to the standards”* – Till today they have not implemented this order.
- b) FILE NO : KSPCB/TS/ICO/10041755/2024 states that –
- c) *2.2 The applicant shall comply with the instructions that the Board may issue from time to time regarding prevention and control of air, water, land and sound pollution*⁴.
- d) *2.4 This consent is granted based on the particulars and affidavit submitted by the Entrepreneur and any violation/non-compliance/submission of false information will lead to cancellation of consent and stringent action against the applicant and occupier.*
- e) *2.7 Stack with adequate stack height shall be provided to keep the emission quality to the standards.*
- f) The RTI from Koratty Grampanchayat states that they do not have effluent plant to filter the Fugitive Emission⁵. They are operating furnace in a thick residential area without any air filtering system.

The National Green Tribunal Principal Bench, New Delhi had given the order concerning the use of Petcoke and given the certain guidelines.

- 7) **BEFORE THE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH, NEW DELHI -** Original Application No. 67/2019 (I.A. No. 32/2019) WITH Original Application No. 138/2019 (I.A. No. 65/2019) Para 3 states *“It is relevant to mention that use of Raw Petroleum Coke*

² Consent no: KSPCB (PCB/HO/ICO/TSR/09/R1/2010) Kerala state pollution control board, 2010 point no 4.7, page 4

³ File No: KSPCB/TS/ICO/10041755/2024, Date of issue: 09-01-2024 point no 2.4

⁴ Consent No: KSPCB/TS/ICO/10041755/2023

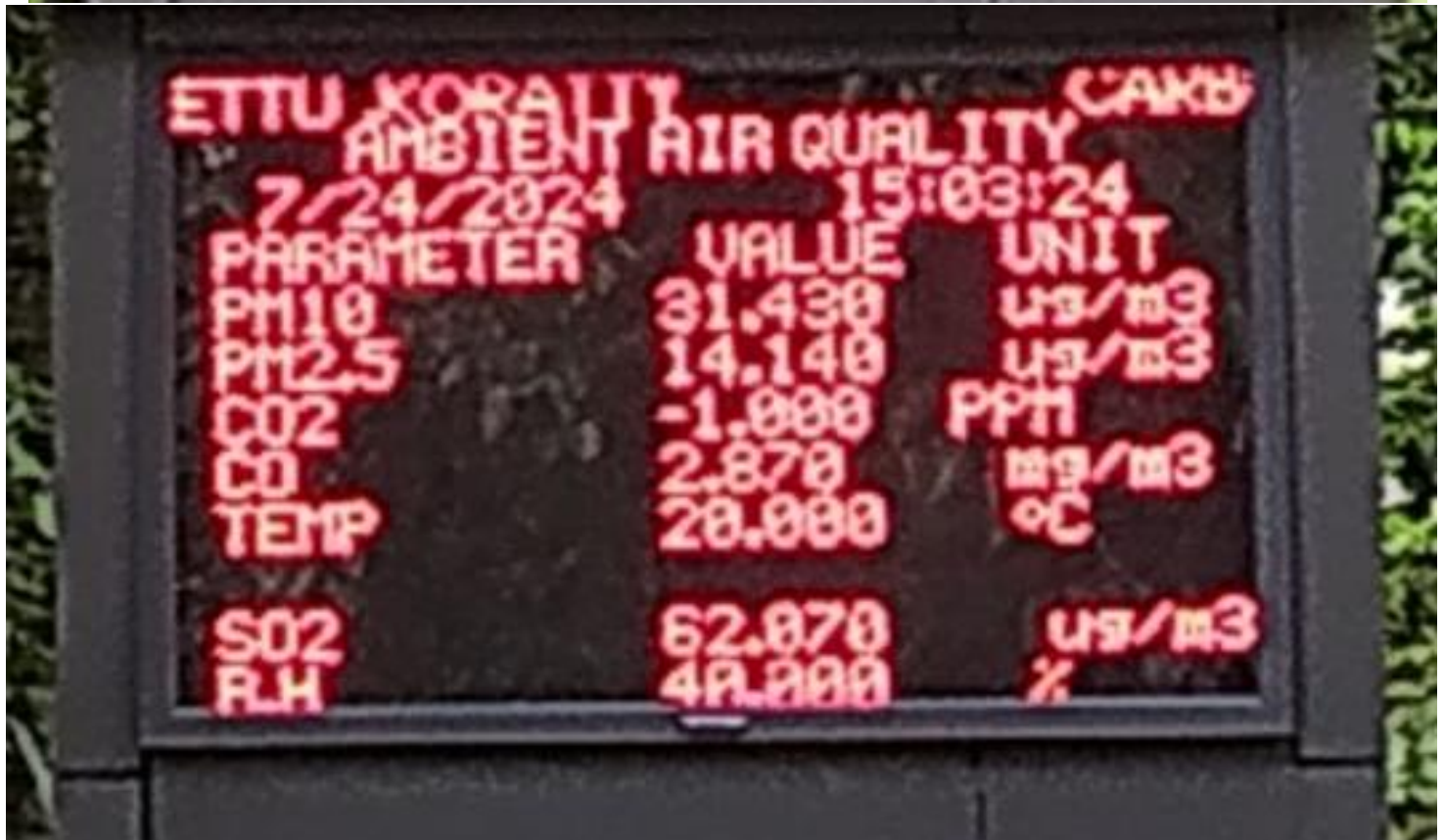
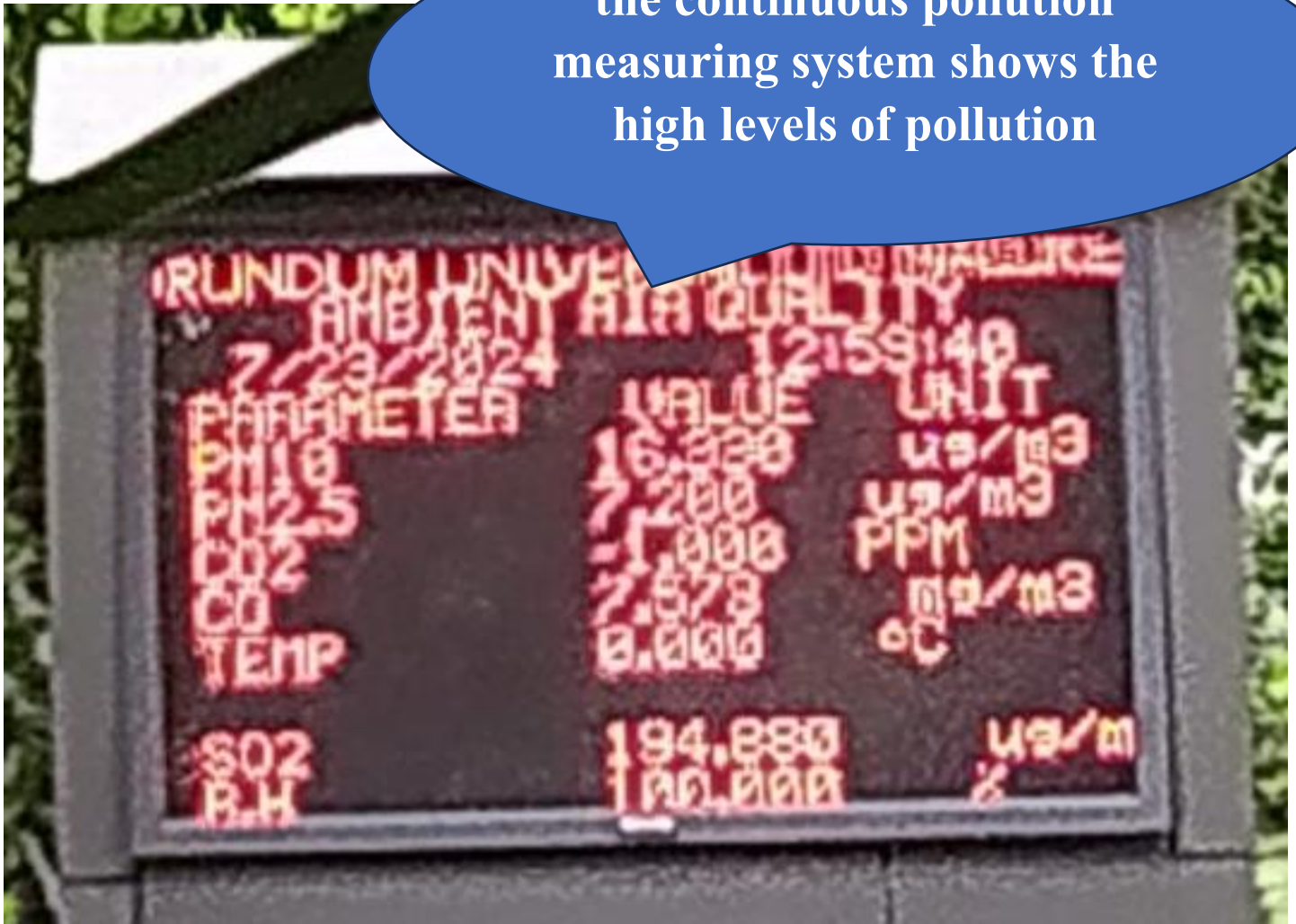
⁵ Koratty gram panchayat

(RPC) in CPC units has been allowed with condition of 90% recovery of SO₂ emission.” They do not have any proper effluent plant to arrest the emission of SO₂. Calcinated Petcoke is supposed to use as feed stack but they are using the raw Petcoke without proper scrubber system and effluent plant and industrial stack

- a) On 23 August 2019 this communication was sent to all the chief secretaries and yet it is not B-33014/ 07 / 2019 / TPC-11 / 5747-5778 concerning the above-mentioned order
- b) FILE NO: KSPCB/TS/ICO/10041755/2024, Date of issue: 09-01-2024 - has given consent to run the furnace despite not having the required industrial stack and effluent plant to arrest the air pollution. Is it not an illegal process. They have been violating the pollution related rules and how can KSPCB give the licence again and again
- c) How can a factory be given a blanket permission to cause air pollution. And KSPCB is very much silent about it and all the more given permission to do cause Air pollution.
- d) The fuel policy is not ready still. It been several years ever since the chief secretary received the letter concerning the order concerning ban of Petcoke. How come the chief secretary is dormant about the whole event.
- e) **We request you to give stay order to the operation of furnace in the carborundum pant at Nalukettu. They should be allowed to operate the furnace only after the installation of the required industrial stack and effluent plant to arrest the air pollution. Kindly find the signed memorandum of the people of the neighbourhoods asking for serious action against the pollution.**

Kindly find the photos proving the complaint.

the continuous pollution measuring system shows the high levels of pollution



the continuous pollution measuring system has been removed. They have not placed a substitute machine



The waste materials of the furnace which as high polluting contents has been dumped in the open area



The waste materials of the furnace which as high polluting contents has been covered up but it is causing water pollution and the rain is accelerating the water source pollution



**the continuous pollution
measuring system is not
functioning now**



Therefore, I request you to look into the matter on an urgent basis and take serious actions against those responsible.

Yours Sincerely

Jonatt Jose



Mr. Vathsan - The health Inspector



Mr. Jonatt Jose, victims of the locality



Mr. Neson, victims of the locality



Mr. C T. Shyju, victims of the locality



Mrs. Lincy Jose, victims of the locality



Mrs. Kochhumariam, victims of the locality



Mr. Francis , victims of the locality



The Reporter of Amrta TV

Telephone No : 0487 - 2374939

E-mail: kspebtsr@gmail.com



കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്
 മജസ്റ്റിക് സ്ക്വയർ, മൂന്നാം നില, പാവട്ടാനി, ഒല്ലൂക്കര പി.ഒ., തൃശ്ശൂർ - 680655
KERALA STATE POLLUTION CONTROL BOARD
 Majestic Square, 3rd Floor, Paravattani, Ollukkara P.O., Thrissur - 680655

PCB/TSR/GEN/59/06

Date: 16.10.2024

From

Public Information Officer

To

✓ Sri. Jonet Jose
 Choorakal House
 Naalukettu P.O
 Koratty
 Thrissur - 680308

Sub:- Right to Information Act 2005-reg.

Ref:- Your application received in this office on 28.09.2024 (Letter No. KSPCB/866/2023-SEE-1 dated 27.09.2024 of Public Information Officer, Head Office, Thiruvananthapuram)

Madam,

The details requested vide letter referred above are furnished below.

- 1)&2) Integrated clearance was implemented by the board as per circular No. PCB/T4/115/97 dated 28/07/2006. For the copy of the circular remit an amount of Rs. 12/- for 4 pages (Rs.3/- per page) at the office or as money order or DD in favour of Kerala State Pollution Control Board payable at Thrissur. Integrated consent is a unified record of the previous Air & Water consents.
- 3) As per available information in this office in the consent issued in 2012, raw material used is petcoke. For the required documents please remit of Rs. 6/- for 2 pages (Rs.3/- per page) at the office or as money order or DD in favour of Kerala State Pollution Control Board payable at Thrissur.
- 4) The application and documents for Integrated Consent to Operate is not available, in this office. Only the correspondence file of the unit from the year 2012 is available in this office.
- 5) Relevant Information is made available in response to question no.3.
- 6) As per Air (Prevention & Control of Pollution) Act, conditions are specified in 4.1 to 4.8 of Integrated ICO. For the copy of consent to operate certificate please remit of Rs. 15/- for 5 pages (Rs.3/- per page) at the office or as money order or DD in favour of Kerala State Pollution Control Board payable at Thrissur.
- 7) An online ambient air quality monitoring and display system is installed in the unit. No guidelines are issued concerning the monitoring of emission.

- 8) No separate permission is given for flaring of gases. No guidelines are given.
- 9) No separate permission is given for cooling. No information regarding the use of chemicals in cooling process is available as per this office records. No guidelines are given for flaring of gases.

- (1) As directed by the Board, the unit had submitted application for Consent to establish a hood with chimney system for the furnaces.

The function of industrial stack is to vent out process emissions.

No details available in the office records regarding ambient air quality monitoring system in the industrial stack. The conditions referred in the question, except 2.2, are not seen in the consent, dated 04.07.2010.

- 10) No guidelines are given recently.
- 16) No sound level monitoring was conducted from this office.
- 19) Details sought are not available in this office. Hence your letter was forwarded to District Office 1, Ernakulam, to give the reply directly to you.
- 20) No information regarding this is available as per this office records.

Yours faithfully,



Remya

Remya Venugopal
Public Information Officer &
Assistant Engineer
Mobile No. 9188921750
Email. kspcbtr@gmail.com.

Other Details

Appeal Time: 30 days

Address of the first appellate authority -

Smt. Suchitra V.,
Environmental Engineer &
Appellate Authority
Kerala State Pollution Control Board
District Office, Thrissur.
Phone: 9447975728

Copy to:

Sri. Krishnan M. N
Public Information Officer & Senior Environmental Engineer
Head Office, Kerala State Pollution Control Board

1984 – 1988

1984 – Silicon carbide plant, Koratty, India



1988 – Silicon carbide Micro grit plant, Koratty, India



CUMI Minerals set forth its journey into non-oxide minerals. The Kerala Village Koratty at Thrissur witnessed the flourishing of a novel production of Silicon Carbide in 1984. Quick to realize the vast applications of SiC micro grits CUMI commissioned The SiC Micro Grit Plant at Koratty in 1988.

In the phot it is very clear that the Petcoke is burning. It is the ignition stage later it burns.



SOME NANOMATERIALS AND SOME FIBRES

VOLUME 111



**IARC MONOGRAPHS
ON THE EVALUATION
OF CARCINOGENIC RISKS
TO HUMANS**

Table 1.9 Regulations and guidelines for silicon carbide worldwide

Type of silicon carbide	Country or region	Concentration	Interpretation	Carcinogenicity
<i>Non-fibrous silicon carbide</i>		(mg/m ³)		
	USA			
	OSHA (PEL)			
	Total dust	15	TWA	
	Respirable fraction	5	TWA	
	ACGIH (TLV)			
	Inhalable fraction ^a	10	TWA	
	Respirable fraction ^a	3	TWA	
	NIOSH (REL)			
	Total dust	10	10-h TWA	
	Respirable fraction	5	10-h TWA	
	United Kingdom			
	Total inhalable	10	TWA	
	Respirable fraction	4	TWA	
<i>Fibrous silicon carbide</i>		(fibres/cm ³)		
	USA			
	ACGIH (TLV) ^b	0.1	TWA	A2
	Europe			
	SCOEL (OEL) ^c	1	TWA	
	Sweden			
	LLV	0.2		C

^a Particulate matter containing no asbestos and < 1% crystalline silica

^b Including whiskers: respirable fibres (length, > 5 µm; aspect ratio, ≥ 3:1) as determined by the membrane filter method at 400–450 × magnification (4 mm objective), using phase-contrast illumination

^c Refractory ceramic fibres, including fibres of silicon carbide

A2, suspected human carcinogen; ACGIH, American Conference of Governmental Industrial Hygienists; C, carcinogenic; LLV, level limited value; NIOSH, National Institute for Occupational Safety and Health; OEL, occupational exposure limit; OSHA, Occupational Safety and Health Administration; PEL, permissible exposure limit; REL, recommended exposure limit; SCOEL, Scientific Committee on Occupational Exposure Limits; TLV, threshold limit value; TWA, 8-hour time-weighted average (unless otherwise specified)

From [HSE \(2011\)](#), [NIOSH \(2011\)](#), [Swedish Work Environment Authority \(2011\)](#), [SCOEL \(2012\)](#), [OSHA \(2015\)](#)

2. Cancer in Humans

2.1 Introduction

Only a few studies that refer directly to exposure to silicon carbide fibres have been published (see [Table 2.1](#)) and concerned workers were engaged in the production of silicon carbide, using the Acheson production process, where exposure to silicon carbide fibres was combined with exposure to a range of other dusts and gases, including non-fibrous silicon carbide. The Acheson process remains the dominant method of producing silicon carbide; the process

and related exposure conditions are described in Section 1. No studies were found of workers engaged in the production of silicon carbide whiskers. Other studies of workers exposed to silicon carbide include cohort studies of downstream users of the product, especially of workers in the abrasives industry. These studies were reviewed but were regarded as uninformative with respect to silicon carbide fibres because the Working Group had no evidence that workers producing or using abrasive materials were exposed to the fibres.

2.2 Silicon-carbide production industry

The first study to be published on a cohort from the silicon-carbide production industry was conducted in Canada by [Infante-Rivard et al. \(1994\)](#). A cohort of silicon-carbide production workers was subsequently studied in Norway by [Romundstad et al. \(2001\)](#) with updates and exposure-response analyses of lung cancer carried out by [Bugge et al. \(2010, 2012\)](#). Due to the similarities between silicon carbide fibres and asbestos, and also due to the observed induction of mesothelioma by silicon carbide whiskers in experimental animals, whether an increased incidence of mesothelioma was observed in the cohort studies was of special interest. Only the two Norwegian studies reported the incidence of pleural cancer or results for cancer sites other than lung and stomach.

In the Canadian study by [Infante-Rivard et al. \(1994\)](#), 585 silicon carbide industry workers employed for more than 2 years during 1950–80 were identified and their vital status, job history, and smoking histories were ascertained until 1989. A JEM on total dust was developed. No information on exposure to silicon carbide fibres specifically was available. Mortality from total and site-specific cancer was compared with that of the general population of the Province of Québec, and also related to cumulative exposure to total dust. The standardized mortality ratio (SMR) for lung cancer was 1.69 (95% confidence interval [CI], 1.09–2.52). Mortality from lung cancer showed a moderate increase with increasing cumulative exposure to total dust (see [Table 2.1](#)). Increased mortality from stomach cancer (SMR, 2.18; 95% CI, 0.88–4.51) was also observed. Data for other cancer sites were not presented. [One strength of this study was the collection of information concerning job history and smoking, either from the worker personally or from relatives. Weaknesses were mainly that the cohort was small and that only total dust

estimates were available. In addition, the method used to account for a minimum latency period (ignoring both years at risk and deaths during the first 15 years of employment) may have reduced the power of the study.]

A cohort of 2620 male workers employed for more than 6 months in 1913–96 in the Norwegian silicon carbide industry was established by [Romundstad et al. \(2001\)](#) and followed up from 1953 to 1996. Data on cancer incidence were obtained from the Norwegian Cancer Registry and comparisons were made with the general Norwegian population. A JEM on total dust, crystalline silica, silicon carbide fibres, and inorganic dust other than quartz and cristobalite, and potentially including silicon carbide particles and cleavage fragments, was constructed. Exposure assessments were mainly based on total dust measurements. An estimation of exposures other than those to total dust was based on a few measurements of these factors, and an estimation of the relative content of these factors in total dust was also made. [Uncertainties regarding exposure assessment due to the strong correlation between the different exposure factors and the small number of measurements precluded any firm conclusions based on the available data.]

[Bugge et al. \(2010\)](#) performed an update of the Norwegian cohort study ([Romundstad et al., 2001](#)), with the addition of employment information until 2003 and a further 9 years of cancer incidence follow-up (until 2005). A full report of cancer incidence in the silicon carbide industry was given in the study, but no exposure-effect analyses were performed. In a second study of the Norwegian cohort by [Bugge et al. \(2012\)](#), which included data on cancer incidence until 2008, a detailed JEM was constructed, based on new exposure measurements and mathematical modelling of historical exposure levels of total and respirable dust, non-fibrous and fibrous silicon carbide, quartz, and cristobalite ([Førelund et al., 2012](#)). In this last study ([Bugge et al., 2012](#)), the relative influence of different exposure factors

Table 2.1 Cohort studies of workers in the silicon-carbide production industry

Reference, location, follow-up period	Total No. of subjects	Exposure assessment	Organ site (ICD code)	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Covariates; comments
Infante-Rivard et al. (1994) , Québec (Province), Canada, 1950–89	585	Job-exposure matrix in 1984, total dust	Lung	Overall Total dust (mg-yr/m ³)	24	SMIR 1.69 (1.09–2.52) IRR	Compared with age- and calendar-specific death rates among Québec (Province) men
				< 105	5	1.00	SIRs from internal analysis; no latency
				105–275	9	1.48 (0.47–4.58)	
				> 275	10	1.67 (0.57–4.83)	
				< 105	5	1.00	SIRs from internal analysis; 15-yr latency
				105–275	9	1.25 (0.40–3.90)	
				> 275	10	1.36 (0.47–3.95)	
			Stomach	Overall	7	SMIR 2.18 (0.88–4.51)	Compared with age- and calendar-specific death rates among Québec (Province) men
Bugge et al. (2010) , Norway, 1953–2005	2612	Personnel records, duration of employment	Lung	Overall	103	2.0 (1.6–2.4)	Compared with age- and period-specific cancer incidence rates among Norwegian men
	1687		Lung	Overall	60	1.7 (1.3–2.2)	Long-term workers (≥ 3 yr of employment)
			Stomach	Overall	25	1.3 (0.9–1.9)	
			Lip	Overall	7	2.4 (1.2–5.1)	
			Oral cavity and pharynx (ICD-7: 141, 143–8)	Overall	10	2.1 (1.1–3.9)	
			Larynx	Overall	3	0.9 (0.3–2.8)	
			Pleura	Overall	1	0.8 (0.1–6.0)	
			Prostate	Overall	77	1.2 (1.0–1.5)	
			Leukaemia (ICD-7: 204)	Overall	6	2.8 (1.2–6.1)	

Table 2.1 (continued)

Reference, location, follow-up period	Total No. of subjects	Exposure assessment	Organ site (ICD code)	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Covariates; comments	
Bugge et al. (2012), Norway, 1953–2008	1687		Lung	Overall	62	1.6 (1.3–2.1)	Long-term workers (≥ 3 yr of employment)	
		Department	Lung	Low exposure	3	1.0	Adjusted for age and smoking	
				Furnace	20	3.8 (1.1–13)		
				Processing	9	1.6 (0.4–5.9)		
				Maintenance	9	1.5 (0.4–5.7)		
				Mixed	21	2.2 (0.7–7.5)		
				Silicon carbide fibres (fibre-yrs/mL)		IRR	Ever-smoking, long-term workers; adjusted for age	
			Job-exposure matrix (Føreland et al., 2012)	Lung	0–0.50	11	1.0	No lag
					0.50–2.0	14	1.0 (0.5–2.2)	
					2.0–93	33	1.7 (0.8–3.3)	
			0–0.50	21	1.0	20-yr exposure lag		
			0.50–2.0	14	1.4 (0.7–2.9)			
			2.0–93	23	2.3 (1.2–4.4)			

CI, confidence interval; ICD, International Classification of Diseases; IRR, incidence rate ratio; SIR, standardized incidence ratio; SMR, standardized mortality ratio; yr, year

(including silicon carbide fibres) was estimated, but only for lung cancer incidence.

In [Bugge et al. \(2012\)](#), the standardized incidence ratio (SIR) for lung cancer in long-term workers (≥ 3 years of employment) was 1.6 (95% CI, 1.3–2.1). The results from the two earlier studies from this cohort showed similar SIRs of 1.9 (95% CI, 1.5–2.3; [Romundstad et al., 2001](#)) and 2.0 (95% CI, 1.6–2.4; [Bugge et al., 2010](#)) for lung cancer in the entire cohort. The highest incidence of lung cancer was observed among workers in the furnace department (SIR, 2.3; 95% CI, 1.5–3.5) and among workers with employment in more than one department (including furnace work) (SIR, 1.9; 95% CI, 1.3–2.9). Among workers in the processing and maintenance departments the SIR was 1.4 for both groups (95% CI, 0.7–2.7 and 0.7–2.6, respectively). Similar patterns of relative risks were observed in analyses using workers with low exposure as the referent group ([Table 2.1](#)). The SIR for lung cancer increased with increasing cumulative exposure to silicon carbide fibres, but also with indicators of other exposures, including cristobalite. Due to a high correlation between the different exposure factors, especially in the furnace halls, Poisson regression models were built to estimate the relative effect of the different exposure factors. The incidence of lung cancer was most strongly associated with exposure to cristobalite (incidence rate ratio, 1.9; 95% CI, 1.2–2.9 per log mg-years/ m^3 unadjusted; and 1.6; 95% CI, 0.8–3.3 per log mg-years/ m^3 adjusted for silicon carbide fibres and non-fibrous silicon carbide). The unadjusted incidence rate ratio with silicon carbide fibres was 1.9 (95% CI, 1.2–2.9 per log fibre-years/ mL), but when adjusted for cristobalite and non-fibrous silicon carbide showed a weaker non-significant association (incidence rate ratio, 1.3; 95% CI, 0.7–2.6 per log fibre-years/ mL).

Data for all other cancer sites were reported by [Bugge et al. \(2010\)](#). Only one case of cancer of the pleura (ICD-9 163) was reported among long-term workers, resulting in an SIR of 0.8

(95% CI, 0.1–6.0), but two cases were observed among the short-term workers (SIR, 3.7; 95% CI, 0.9–14.7). [The Working Group noted that the report did not provide information on the time elapsed between exposures in the silicon carbide industry and the diagnosis of mesothelioma.] The SIR for stomach cancer was 1.3 (95% CI, 0.9–1.9), while that for larynx cancer was 0.9 (95% CI, 0.3–2.8). An increased incidence of cancer of the oral cavity and pharynx (SIR, 2.1; 95% CI, 1.1–3.9; 10 cases), lip cancer (SIR, 2.4; 95% CI, 1.2–5.1; 7 cases), prostate cancer (SIR, 1.2; 95% CI, 1.0–1.5; 77 cases), and leukaemia (SIR, 2.8; 95% CI, 1.2–6.1; 6 cases) was also observed among the long-term workers. SIRs did not differ significantly from unity for other cancer sites in this group ([Bugge et al., 2010](#)). [Although elevated SIRs were observed for several cancers other than the lung, the confidence intervals were wide, the cancer sites are not known to be specific for exposure to fibres, and numerous comparisons were made. In light of these considerations, the Working Group concluded that a causal interpretation was not possible.]

[The strengths of this study were the access to a detailed JEM, based on a large number of new parallel measurements of total dust, respirable dust, respirable quartz, cristobalite, and non-fibrous silicon carbide, and fibrous silicon carbide. Mathematical modelling of historical exposure to several agents present in the industry allowed analyses of the exposures that were most strongly associated with cancer incidence. However, uncertainties still existed because historical total dust exposures before the late 1960s were estimated based only on knowledge about changes in the work organization and working hours. Correlations between estimated exposures to several agents, including silicon carbide particles and crystalline silica, challenged the interpretation of associations with silicon carbide fibres.]

2.3 Silicon-carbide user industry

Five studies on the incidence of or mortality from cancer with data from industries that use silicon carbide were found, two of which were carried out in the abrasives producing industries. [Wegman & Eisen \(1981\)](#) conducted a proportionate mortality study of abrasives manufacturers in Massachusetts, USA, and [Edling et al. \(1987\)](#) studied cancer incidence among Swedish workers manufacturing abrasives. The other three studies were performed in industries using abrasives for polishing. [Sparks & Wegman \(1980\)](#) studied proportionate mortality among jewellery polishers in Massachusetts, USA, [Järholm et al. \(1982\)](#) studied cancer incidence among steel polishers in Sweden, and [Jakobsson et al. \(1997\)](#) studied cancer incidence among workers in a Swedish stainless steel factory.

[These studies contained very little information on levels of exposure to dust in general and no information on exposure to silicon carbide fibres specifically. Because the Working Group had no evidence that workers producing or using abrasive silicon carbide products have significant exposure to silicon carbide fibres, these studies were not considered to be relevant for the evaluation.]

3. Cancer in Experimental Animals

Studies of fibrous silicon carbide in experimental animals were available only for silicon carbide whiskers and only in rats.

3.1 Inhalation

See [Table 3.1](#)

Two groups of 40 AF/Han specific pathogen-free rats [sex and age unspecified] were exposed by inhalation for 7 hours per day on 5 days a week for approximately 12 months to silicon carbide whiskers (Advanced Composite

Materials Corporation (ACMC), Greer, SC, USA; mean diameter, 0.45 μm ; 984 whiskers/mL, > 5 μm in length in airborne dust clouds). After exposure, the rats were allowed to live their full life-span, although the study was terminated when the number of survivors in each group decreased to 6. Moribund animals and those surviving to the end of the study were killed and the lungs were examined microscopically for tumours. In the silicon carbide whisker-exposed rats, pulmonary carcinomas were present in 5 out of 42 (12%) [not significant] animals, pulmonary adenomas in 5 out of 42 (12%) [not significant] animals, and pleural mesotheliomas in 10 out of 42 (24%) [$P = 0.0003$] animals ([Davis et al., 1996](#)). A concurrent control group was not included in the study; however, the authors stated that in a group of control rats of the same strain and maintained in the same laboratory from a previous study with a similar study design, the incidence of pulmonary adenoma was 1 out of 47 (2%), that of pulmonary carcinoma was 1 out of 47 (2%), and that of mesothelioma was 0 out of 47 ([Davis et al., 1991](#)). [The Working Group noted the absence of a concurrent control group. Statistical analysis was not performed by the authors, but statistics were calculated by the Working Group based on the incidence of tumours reported for the control group of the previous study.]

Two groups of 42 male Wistar rats (age, 4 weeks) were exposed by inhalation for 6 hours per day on 5 days a week for 12 months to silicon carbide whiskers (GM length, 2.8 μm ; GM diameter, 0.5 μm ; mass median aerodynamic diameter [MMAD], 2.4 μm ; daily average fibre count, 98 ± 19 whiskers/mL) or clean air (control) and were killed 6 days, or 3, 6, or 12 months after exposure. No lung tumours were reported. However, 12 months after exposure, fibrotic changes were present in the lungs and bronchiolo-alveolar hyperplasia was observed in two exposed animals ([Akiyama et al., 2007](#)).

[The Working Group noted that this study was designed to evaluate the biopersistence of silicon

are variable, but can fulfil the WHO definition of fibres, and may include fibres that are indistinguishable from whiskers. Silicon carbide fragments (probably derived from the cleavage of non-fibrous silicon carbide crystals), also corresponding to the WHO definition of fibres, were found in the processing department and in sorting operations.

Other methods for the production of silicon carbide particulates, fibres, or whiskers exist but have not been well documented with respect to the generation of fibrous silicon carbide in the air.

Silicon carbide production began in the early twentieth century mostly for use as abrasives. Carborundum is a commercial name for silicon carbide abrasives and is occasionally used as a common name for silicon carbide dust. In 2013, the global production capacity was estimated to more than 1 000 000 metric tonnes, of which China was the leading producer. The available information on production levels mostly concerns the Acheson process. Additional applications of silicon carbide include: refractories, electrical devices, electronics, diesel particle filters, ceramics, industrial furnaces, structural materials, metallurgy, and in the aerospace, automotive, and power generation industries as reinforcing materials in advanced ceramic composites. Unwanted fibres from the Acheson process are usually recycled in further reactions in the Acheson furnace; they may also occasionally be sold as part of metallurgical-grade silicon carbide. Silicon carbide whiskers are used as a durable industrial substitute for asbestos.

Insufficient data have been reported to reach a conclusion on the exposure of workers to whiskers and silicon carbide dust used as abrasive products. However, high levels of silicon carbide fibres have been measured in the Acheson process during the mixing of materials, furnace operations, and the separation of products with average concentrations of > 0.1 fibres/cm³. The majority of the silicon carbide fibres were thin

with an average diameter < 1 µm and an aspect ratio > 35 . Lower levels of fibres have been measured in the processing department, but cleavage fragments were present at higher concentrations. Exposures to respirable silicon carbide fibres were confirmed by the analysis of human lung tissues. Most of the fibres in lung samples were < 5 µm in length. In silicon carbide industries, workers are also co-exposed to quartz and cristobalite.

5.2 Human carcinogenicity data

The carcinogenic risk associated with exposure to silicon carbide fibres has been investigated in two cohort studies of occupational exposure among workers using the Acheson process in silicon-carbide manufacturing plants. This process is characterized by multiple exposures, among them fibrous and non-fibrous silicon carbide, quartz, and cristobalite. The first cohort study included workers in the Canadian silicon-carbide manufacturing industry. An excess of mortality from lung cancer was observed in comparison with the general population. Mortality from mesothelioma was not reported for this cohort. In the second cohort, the incidence of lung cancer was investigated among workers in the Norwegian silicon-carbide manufacturing industry. In a series of studies, the most informative analysis was limited to long-term workers with at least 3 years of employment, and was based on a detailed job-exposure matrix taking into account total and respirable dust, non-fibrous and fibrous silicon carbide, quartz, and cristobalite. Overall, the incidence of lung cancer was increased, with the highest risk for workers in the furnace department who were believed to have the highest exposures to fibrous silicon carbide and crystalline silica dust. In multivariate modelling, an exposure-response effect was observed for silicon carbide fibres. The effect was weakened and no longer statistically significant after adjustment for concurrent exposure to cristobalite. The Working Group noted

that the strong correlation between exposures to silicon carbide fibres and cristobalite made the disentanglement of their respective effects difficult. Silicon carbide particles were not associated with cancer of the lung independently of silicon carbide fibres or cristobalite. No excess in the incidence of mesothelioma was observed in the Norwegian cohort. No data were available on cancer in populations exposed to manufactured silicon carbide whiskers.

5.3 Animal carcinogenicity data

Studies of fibrous silicon carbide in experimental animals were available only for silicon carbide whiskers.

Silicon carbide whiskers significantly increased the incidence of mesothelioma in three studies in female rats treated by intrapleural injection, intrapleural implantation, or intraperitoneal injection, and the increase was dose-related in rats treated by intraperitoneal injection. In a study in female rats treated by intratracheal instillation with two types of silicon carbide whiskers, judged by the Working Group to be limited because of its short duration, no treatment-related neoplasms were observed. One study of inhalation in male rats and one study of intraperitoneal injection in female rats gave negative results.

Mesotheliomas were reported in one study of intraperitoneal injection in female rats and in one study each of inhalation and intraperitoneal injection in rats (sex unspecified); however, these studies did not include concurrent controls. Because the background incidence of mesotheliomas is very low in rats, some consideration was given to these three studies that gave positive results, despite their lack of concurrent controls.

5.4 Mechanistic and other relevant data

5.4.1 Silicon carbide produced by the Acheson process

Airborne silicon carbide from the Acheson process, containing silicon carbide dust and fibres, can be deposited and retained in the human lung. After intratracheal instillation, silicon carbide dust and fibres were retained in the lungs of sheep. Mechanistic studies on silicon carbide materials in humans are lacking. The few available studies in experimental animals do not provide any insight into the mechanisms of carcinogenicity.

5.4.2 Silicon carbide whiskers

Studies on silicon carbide whiskers demonstrated biopersistence in the rat lung. The Working Group noted the lack of studies on the translocation of silicon carbide materials to the pleural cavity in experimental animals. Pulmonary exposure to silicon carbide whiskers in experimental animals has been associated with lung cell injury, inflammation, and fibrotic responses. Oxidative stress has been reported in studies *in vitro*. Genotoxicity measurements were limited to *in-vitro* studies. One study of genotoxicity demonstrated chromosomal aberrations in human embryonic lung cells exposed to silicon carbide whiskers. The few available studies reported data which are fully consistent with the mechanisms of carcinogenicity proposed for asbestos and erionite (see *IARC Monographs Volume 100C*).

5.4.3 Silicon carbide nanoparticles

Mechanistic studies of silicon carbide nanoparticles are sparse. The production of reactive oxygen species and the depletion of antioxidants have been reported in a few *in-vitro* studies, which have not been independently replicated

across different cell cultures or in in-vivo models and thus do not provide conclusive evidence that oxidative stress is a mechanism of the toxicity of silicon carbide nanoparticles. The results from experimental models do not provide adequate information to support a conclusion regarding the potential mechanisms of carcinogenicity of silicon carbide nanoparticles.

6. Evaluation

6.1 Cancer in humans

There is *sufficient evidence* in humans for the carcinogenicity of occupational exposures associated with the Acheson process. Occupational exposures associated with the Acheson process cause cancer of the lung.

There is *limited evidence* in humans for the carcinogenicity of fibrous silicon carbide. Positive associations have been observed between exposure to fibrous silicon carbide and cancer of the lung.

6.2 Cancer in experimental animals

There is *sufficient evidence* in experimental animals for the carcinogenicity of silicon carbide whiskers.

6.3 Overall evaluation

Occupational exposures associated with the Acheson process are *carcinogenic to humans (Group 1)*.

Fibrous silicon carbide is *possibly carcinogenic to humans (Group 2B)*.

Silicon carbide whiskers are *probably carcinogenic to humans (Group 2A)*.

6.4 Rationale

Rationale for a separate evaluation of whiskers and fibres – majority view

The rationale for a separate evaluation of whiskers and fibres is based on differences in the nature of the agents.

The cohort of workers at plants using the Acheson process was occupationally exposed to non-fibrous and fibrous silicon carbide, potentially including some fibres that could be defined as whiskers, whereas exposure in most of the studies in experimental animals and in experimental systems was to silicon carbide whiskers.

Silicon carbide whiskers are monocrystalline and homogeneous in form, while fibrous silicon carbide is mostly polycrystalline and heterogeneous in form. The physico-chemical characteristics of these fibres were considered to be distinct, and therefore the fibres and whiskers warrant separate evaluations.

Rationale for a combined overall evaluation of whiskers and fibres – minority view

The argument for a combined overall evaluation of silicon carbide whiskers and fibres was that a proportion of the fibres in the epidemiological study in Norway had dimensions that were consistent with silicon carbide whiskers, and were morphologically indistinguishable from silicon carbide whiskers under electron microscopy. Thus, the excess of cancer of the lung observed was relevant for evaluating the carcinogenicity of silicon whiskers as well as other fibrous silicon carbide. Had the minority view been adopted, it would have supported an overall evaluation of *probably carcinogenic to humans (Group 2A)*.

Rationale for classification in Group 2A – majority view

A narrow majority of the Working Group voted for the classification of silicon carbide whiskers as *probably carcinogenic to humans (Group 2A)* rather than as *possibly carcinogenic to humans (Group 2B)*.

The majority view was primarily based on their expert opinion that the major physical properties of silicon carbide whiskers resembled those of asbestos and erionite fibres, which are classified as *carcinogenic to humans (Group 1)*. This information was used to upgrade the overall evaluation of carcinogenicity to humans to Group 2A.

Rationale for classification in Group 2B – minority view

A minority of the Working Group voted for the classification of silicon carbide whiskers as *possibly carcinogenic to humans (Group 2B)* because:

- the evidence for the carcinogenicity of silicon carbide whiskers in experimental animals was based on direct bolus delivery into the pleura or peritoneum at high mass doses;
- only one study of inhalation was available and was considered by the minority as inadequate for the evaluation due to lack of concurrent unexposed controls; and
- the available mechanistic data did not provide strong support for an upgrade of the overall evaluation.

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To,

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Prime Minister's Office,
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- 2 The Central Public Information Officer,
Central Pollution Control Board
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- 3 The Secretary,
The Ministry of Environment & Forests & Climate Change
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- 4 The Joint Director
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- 6 Chief Environmental Engineer, KSCSTE
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- 8 The Secretary,
Directorate of Environmental & Climate Change, (DoECC),
4th Floor, KSRTC Bus Terminal,
Thampanoor, Thiruvananthapuram: 695001,
- 9 The Manager,
Carborandum Universal Limited,
Nalukettu Po, Pin: 680 308
Thrissur District.

Mass Petition: Complaint letter about environmental pollution caused by Carborandum Universe located in the 6th Ward of Koratty Gram Panchayat of Thrissur District.

- 10 Pollution Control Officer,
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Thrissur, Pin: 680655
- 11 The Health Inspector,
Thrissur District office of Health,
5th Circle, North Bus Stand,
- 12 The District Collector,
Thrissur District,
District Collector Office,
1st Floor, Civil Station,
Ayyanthole, Thrissur- Pin: 680003
- 13 Chairman
Ex officio Principal Secretary,
Dept. of Science & Technology
Executive Vice President, KSCSTE
Head Office, Pattom PO,
Thiruvananthapuram, Kerala - 695004.
- 14 Member Secretary, KSCSTE
Head Office, Pattom PO,
Thiruvananthapuram, Kerala - 695004.
- 15 Chief Environmental Engineer, KSCSTE
Head Office, Pattom PO,
Thiruvananthapuram, Kerala - 695004.
- 16 Public Information Officer & Assistant
Environment engineer, KSCSTE
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Subject: Complaint about environmental pollution company named Carborundum Universe located in the 6th Ward of Koratty Gram Panchayat of Thrissur District.

Respected Sir/Madam,

We the people of Nalukettu, Vlangamuri and Palappilly live in the Kizhakkumuri Thaluk in the district of Thrissur, Kerala would like to bring to your urgent notice concerning the environmental

Mass Petition: Complaint letter about environmental pollution caused by Carborundum Universe located in the 6th Ward of Koratty Gram Panchayat of Thrissur District.

pollution at an hazardous level caused by Carborundum Universal Limited, due to the use of banned Petroleum coke located at Nalukettu PO, Thrissur District. There are hundreds of families residing in this Thaluk and the factory is located at the center of these above-mentioned places. We live in the above-mentioned places since childhood and our ancestors also lived in this place for more than a century. The Carborundum Universal Limited was established in the year 1985 which operates in the 6th ward of Nalukettu, Thrissur District.

Silicon Carbide is manufactured by this company. Silicon carbide is produced through a chemical process where raw materials such as silica, petroleum coke and quarts are burned at 1200 to 1400 degree Celsius for 48 hours. The total process of furnace combustion takes 48 hours. It gives off an intolerable smell like that of rotten eggs when these combinations are burned in the furnace for 48 hours. Petroleum coke is used during the manufacture of silicon carbide. Carbon dusts, sulphur content, carbon dioxides and carbon monoxide and nitrogen are emitted from this industrial establishment during the combustion. Due to this recurrence, the residence of the area also suffering from coughs, respiratory diseases, headaches, itching, loss of memory, irritations and allergy to the skin, respiratory diseases and vomiting and sleeplessness due to breathing of the poisonous gasses and fumes. These problems arise due to quick cooling and increased production. These chemicals cause the surrounding iron structures to corrode. We are victims of constant health issues, especially cough and respiratory diseases.

A signed mass petition of 91 residents has been submitted to the concerned authorities demanding a solution to this devastating phenomenon. The right to live in a pollution-free environment is a part of the fundamental right to life under Article 21 of the Constitution. The concern was raised by the people of Nalukettu, Vlangamuri and Palappilly and in particular Mr. Jonatt and family for the last 10 years never yielded any fruitful result till today despite informing the Panchayat presidents, Local ward members and MLAs. This phenomenon has been disturbing our sleep and degenerating our health. Initially the factory informed us that they are burning silica and carbon with the help of electricity in the furnace and therefore, there were no much health issues to the local residents in the past. But over the years instead of electricity, they have started using petroleum coke (banned material) as raw material which becomes a fuel by Pyroprocessing when it is heated in 400-600c for cost-effective and high profits. The use of petcock also produces emissions of sulphur and potential for water pollution through nickel and vanadium runoff from refining and storage.

In this regard, we had approached the concerned authorities over the years to find a solution to the problems. The concerned authorities are the following, Mr. Satheesan (Regional Manager) Mr. Biju Isaac (Manager) Mr. Suresh Varghese (Regional Manager) Mr. Sanjay (HR) Mr. Anu (HR) Mr. Nibu John (HR) Mr. Sion (HR) Mr. Suresh H R Head at Kalamassery) Rajesh Kuruvila (present manager). No action has been taken till date and in fact their reply has been their claim of having all required certificates and licenses to run the industry. The company has claimed that they have all the required certificates to run the factory. So, we would like to know whether all the concerned departments have done the proper study of the factory in terms of the suitability of running a factory all these years. To make things worse they threatened us to face legal action if there were more complains and protest. Approval of plan and permission to construct/extend/or take into use any building as a factory under the Factories Act, 1948

Mass Petition: Complaint letter about environmental pollution caused by Carborundum Universe located in the 6th Ward of Koratty Gram Panchayat of Thrissur District.

demands Position and the drawing of the Effluent Treatment Plant. The RTI that we have received from the concerned authorities clearly states that they do not have the Effluent Treatment Plant. It is compulsory to have an industrial stake if furnace is operated but they do not have the necessary industrial stack and yet they have received the permission from the concerned authorities. A copy of the reply received from the Ministry of Environment Forest and Climate Change CP Division stating that burning of petroleum is prohibited. From the RTI at the Pollution Control Board in Thrissur, it has also been clarified that neither the industrial stack nor the effluent treatment plant is used in the furnace of this company. The reply from the Koratty gram panchayat and the RTI given by the Junior Superintendent and State Public Information Officer also stated that the company does not have any systems to treat the chemical gases.

It is highly dubious whether the process for approval for ISO and permission to operate furnace has met the required guidelines and tests. The application also raises the issue of non-implementation of various environmental laws, more particularly non implementation of the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, and the Environmental Impact Assessment Notification, 2006, which has led to adverse impacts of climate change across the country. Green Tribunal has given permission only to few specific sectors. It is highly dubious whether carborundum universal limited falls under permitted category or not.

Local people have given complaints since it has been polluting the environment and causing health hazards to the local people. After much efforts and complaints, Ambien air quality monitoring system (a continuous pollution measuring system) has been placed in the factory campus to monitor the population rate of the carborundum universal limited. The factory has set up powerful air blowers to redirect the polluted air and fume to the opposite direction of the continuous pollution measuring system. So that the system might not recognize the pollution level. This is to cover-up the serious air pollution that the factory is emitting. As a matter of fact, the machine might produce wrong data in favour of the factory and establish wrong information that carborundum universal limited plant at Nalukettu doesn't cause any air pollution. We feel it is outright mockery over the village and the pollution control Board.

They are permitted to use 20 M T/d tons of pet coke in a day but we have come to know that they are burning more than 45 M T/d tons per day at a time. Thus, they are emitting more than double the number of poisonous gases and fumes. The sulphur content of pet coke is 4% to 7% and if this the calculation the quantity of sulphur burned in the factory is 1800 to 3150 kg.

The factory has lodged cases in the police station against the people who have made such complaints. The Health Inspector and the Pollution Department headed by Mrs. Soumya A.S. Public Information Officer & Assistant Environment engineer, KSCSTE had visited the houses and their surroundings and were convinced of the problems. From the response received from RTI, it is also clear that petroleum coke has been used as raw material in Carborundum Universal Limited. Silicon and petroleum coke are mixed in a certain ratio and burned at 600 degrees to 700 degrees with the help of electricity. The flash point of Pet Coke is 600 to 700 degrees and once pet coke is ignited the electricity supply is reduced since pet coke functions as fuel to burn the furnace. Petrol coke is used as a substitute for carbon and it facilitates the needed 1200 degrees to 1400 degrees heat to make silicon carbide. So, the

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purpose of use of Pet coke is to reduce the use of electricity which is highly expensive. This phenomenon is a profit to the company and lose to Kerala Government since they are evading the use of electricity. It is suspected that these irregularities are also being committed in Carborundum Universal Limited furnace plant at Kalamassery. This should be checked and necessary steps should be taken. The presence of carbon dioxide, carbon monoxide, and carbon particles causes fatal diseases like asthma and cancer, and it also causes damage to iron materials.

Report by CPCB dated 30.06.2020 in OA 67 of 2019 and 138 of 2019 states that *"WHEREAS, Hon'ble Supreme Court in above mentioned order dated 09.10.2018 noted PCB's report regarding use of pet coke as feed stock in CPC units wherein it was recommended that due to emission of SO2 in high concentrations the emissions need to be treated in FCD systems having removal efficiency more than 90% and also noted that the views expressed by CPCB have been considered by MoEF&CC which is in agreement with the CPCB. Can the factory that does not follow this instruction be given renewal of licence? and if it is given is the legal action? Has KSPCB given any such permission to any factory?"*

Orders to permit use of imported pet coke only in certain processes / industrial sectors (in India) are as follows,

1. Order dated 26.07.2018 (permitting use of imported Pet Coke only in Cement Kilns, Lime Kilns, Calcium Carbide and Gasification (in Oil Refinery))
2. Order dated 06.09.2018 (permitting import of Needle Pet Coke in Graphite Electrode Industry)
3. Order dated 09.10.2018 (permitting use of imported Calcined Pet Coke in Aluminium Industry and use of imported anode grade Raw Pet Coke in CPC manufacturing units)

Approval of plan and permission to construct/extend/or take into use any building as a factory under the Factories Act, 1948 demands Position and the drawing of the Effluent Treatment Plant. The RTI that we have received from the concerned authorities clearly states that they do not have the Effluent Treatment Plant.

The display of continuous pollution measuring system is not visible to the public to know whether the system is genuinely functioning or not. We strongly feel that there is a foul play in this process. Kindly look into the matter to assess the situation. They are breaching the labour law of India by making the local and guest workers as contract workers in the production areas of the company. Asbestos sheet is a banned material in India and they are still using this material over the furnace which causes lot of health issues. Global warming has been a serious issue of the time it is very sad to see that the concerned departments are not stepping into this serious issue caused by this industrial. The various measures taken both by national and international bodies are not implemented.

Doctors have recommended our families to shift the place of residence since it is not suitable to live in. This application indents to bring to your kind notice that, Carborundum Universal Limited has been emitting poisonous gases and fumes in the process of combustion of Pet coke which is a banned fuel in India by honourable Green Tribunal of India. This application brings to the notice of the concerned departments of the various illegal practices that are going on in the factory which are seriously dangerous

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to the health of the citizens of India. All the RTIs received from the Government offices make it clear that this industrial establishment is performing in an illegal manner. We request all the concerned officials in a special manner the factory inspector to take the necessary actions to address the issues and close down this illegal industrial establishment as it is violating all the orders that are given by Supreme court of India. The major factor for all these issues and the environmental pollution at an hazardous level is the use of Pet Coke in Kerala. Therefor, we all humbly request you to stand with the order of the supreme court order of ban of Petroleum Coke in Kerala. This will solve the major problem of environmental pollution at an hazardous level in our area.

Yours Faithfully

People of Nalukettu, Vlangamuri and Palappilly and other victims of Carborundum Universal Limited

Sl No	Name	Ph No	Place
1	Jonatt Jose	9400165674	Nalukettu Jose
2	CM Jose	9400164675	" Jose
3	Lincy Jose.	"	Ampldore.
4	MARY CHRILY	9633692894	MARY
5	Jessy Jose	9497655195	Jose
6	BIYA JOSEPH	9496988852	Biya
7	Aleesha Shaju	8547526252	Aleesha
8	MARY Poulouse	8891498852	MARY
9	Anjuna Aneesh	9562718239	Anjuna
10	Chinnermma Mathew	9562718239	Ch

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11	Paul P.P	9846127614	Paul
12	Mathew Pallykashu	2012790684	Mathew
13	Akhil Kumar	9747806469	Akhil
14	Shylaja. K.R	9447688440	Shylaja
15	Nayana Sheerughan	9497700044	Nayana
16	Pravara	9656540190	Pravara
17	Pravara	9656540190	Pravara
18	Pravara	7736431251	Pravara
19	M.T. Pravar	9645323568	Pravar
20	Susila Babu	9497098146	Susila
21	MANOJ	9497413526	Manoj
22	Mini.	8547726526	Mini
23	K.K. Dama	9645323568	K.K. Dama
24	Biju.V.P.	9645323568	Biju
25	Pravara	9048755856	Pravara
26	Pravara	9048755856	Pravara
27	Asanth.TA.	9744109810	Asanth
28	Pravara	9645323568	Pravara
29	Pravara	7034592487	Pravara
30	Vineeth.K.V.	9646097327	Vineeth

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31	Nk Rajan	9539173218	
32	SUMALATHA VIJU	9530325050	
33	Kamatachi	"	
34	Bala Krishan	"	
35	Prem das	9446231903	
36	chandrasekhar	9497652182	chandrasekhar
37	Ammi choudhary	9446231903	
38	KRISHNADASI	6-2828869	
39	Ajitha Thilakan	8281688511	Ajitha
40	P.R. Anand	99464043	
41	P.K. Babu	9946321885	
42	K.K. Velayudhan	9447179540	
43	Vineetha Abhimanyu	9539270895	Vineetha
44	Abhimanyu - K.V	9447179540	
45	Bindhya A.B.	9847989031	
46	Kamalakshi Ravi	9846381233	
47	Jini K.G	9961348814	
48	Francis	8594052328	
49	Dinil Francis	9526630410	
50	SHIBU MON	9544558864	

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51	M. J. J.	7034371803	<u>Jones</u>
52	Anie Joseph	9495811973	<u>Anie</u>
53	Sandra George	7012038741	<u>Sandra</u>
54	Joel George	9645273973	<u>Joel</u>
55	George Paul	9744907642	<u>George</u>
56	Rajeev P.G.	8891760568	<u>Rajeev</u>
57	Hari Govind P.R	9562952548	<u>Hari</u>
58	C.V. GEORGE	9497803305	<u>George</u>
59	TRESSA GEORGE	2730106	<u>Tressa</u>
60	Sahadevan	9947117061	<u>Sahadevan</u>
61	Babu P. Choorakal	9496348309	<u>Babu</u>
62	Gracehina George	9497279810	<u>Gracehina</u>
63	Sona Grace	761644588	<u>Sona</u>
64	Medus	9846927426	<u>Medus</u>
65	Annette Antony	9497063517	<u>Annette</u>
66	P.I Antony	9497063517	<u>Annette</u>
67	P.P Sheela	"	<u>Annette</u>
68	Henry Antony	"	<u>Annette</u>
69	Austin Antony	"	<u>Annette</u>
70	Joy John	9446627315	<u>Joy</u>

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71	Preetha Joy	9048900585	Preetha
72	ഗോപിനാഥ് കെ.എ	94996207517	Gopinath
73	അനീലാഭിഷ്യാമി	2735314	Anieel
74	Francis K.P.	7034634612	Francis
75	റോമൻ കെ.എ	9995128137	Roman
76	BIJU N.S	9048453692	BJ
77	രമേശ്. P.D.	9745863435	Ramesh
78	റാമൻ. ഗോപാൽ	9656943807	Ram
79	രമേശ്. മി.എ.	9745715851	Ramesh
80	രമേശ്. മി.എ.	96057969 TH	Ramesh
81	മിമൻ. ഗോപാൽ	9582111463	Mimhan
82	മിമൻ. മി.എ.	8943791790	Mimhan
83	മിമൻ. മി.എ.	8943791790	Mimhan S.
84	Savio Sebastian	8593091408	Savio
85	RIDO R JOSEPH	9744164151	Rido
86	Joby .v.p vediyen	7356627780	Joby
87	Joby .Joby .vediyen	7736616689	Joby
88	K.P. SOBY	9048623836	K.P.
89	Bibitha Santhosh.	9995913028.	Bibitha
90	Santhosh.	"	Santhosh

Mass Petition: Complaint letter about environmental pollution caused by Carborundum Universe located in the 6th Ward of Koratty Gram Panchayat of Thrissur District.

91	നാരായണി	No	മ
92	ലാലോണ്	8943846284	വ
93	സമീര	9074353240	Sevika
94	തിരുവിന)	Bevika
95	സ്വാതി	7034606336	Sweetly
96	ചിന്നിര	9567059296	Vineth
97	F. രാമേശ്വര	9388902546	A
98	നീലകണ്ഠ. N.B.	8590184788	Neelak
99	നീലകണ്ഠ. സ. രാമ	8590184788	Neel
100	നീലകണ്ഠ. രാമ	9946480004	Neel
101	നീലകണ്ഠ. രാമ	9946480004	Neel
102	നീലകണ്ഠ. രാമ	9946480004	Neel
103	നീലകണ്ഠ. രാമ	8086842024	Neel
104	നീലകണ്ഠ. രാമ)	Neel
105	നീലകണ്ഠ. രാമ	9072378805	Neel
106	നീലകണ്ഠ. രാമ		Neel
107	നീലകണ്ഠ. രാമ	8959499316	Neel
108	നീലകണ്ഠ. രാമ	9856422619	Neel
109	നീലകണ്ഠ. രാമ		+
110	നീലകണ്ഠ. രാമ		Neel

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The Detailed Explanation and study of the Matter

1. Carborundum Universal limited plant at Nalukettu has not installed the prerequisite Flue gas desulphurization system having efficiency of Sulphur (So₂) emission removal more than 90% last 40 years. :- *“It is relevant to mention that use of Raw Petroleum Coke (RPC) in CPC (Calcinated Petroleum Coke) units has been allowed with condition of 90% recovery of SO₂ emission. The same principle may be followed in industrial processes where use of FO as feed stock is considered by States/UTs”*.¹ *“There shall be emission of SO₂ in high concentration (para 1 of results) which needs to be treated in Flue gas desulphurization system having efficiency of Sulphur removal more than 90%²”*. (Annexure 1)
2. The document *“Decarbonisation options for the Dutch silicon carbide industry”* speaks very well about the need of Flue gas desulphurization system to capture the various gases especially Sulphur (So₂). *The process gas collected under the PE foil comes from a common system to the desulphurization plant (PRF). This gas consists of circa 1% hydrogen sulphide (H₂S), and its removal is necessary to reduce finally SO₂ emission. The volatile sulphur composites (SO₂, H₂S, CS₂, COS, and CH₃SH) originate from the sulphur present in the pet coke and from side-reactions in the SiC production. The H₂S emission and other volatile components can cause several odour problems even in the lowest concentrations and have to be controlled according to the environmental rules. The coke also contains additional polycyclic aromatic hydrocarbons (PAHs) and heavy metals in small amounts which also needs to be addressed³*. (Annexure – 12)

¹ **Amarjeet Kumar vs Union of India** National Green Tribunal Principal Bench. (2021, March 17). *Amarjeet Kumar vs Union of India* file:///D:/Downloads/Amarjeet_Kumar_vs_Union_Of_India_on_17March2021.PDF. (Annexure 1 para 3)

² **Amarjeet Kumar vs Union of India** (Annexure 1 – para 6 ii)

³ Xavier, C., & Oliveira, C. (2021). *Decarbonisation options for the Dutch silicon carbide industry*. PBL Netherlands Environmental Assessment Agency; TNO. The Hague, Netherlands. PBL Publication Number: 4285. TNO Project Number: 060.33956 / TNO 2021 P10837. Retrieved from https://www.pbl.nl/sites/default/files/downloads/pbl-2021-decarbonisation-options-for-the-dutch-silicon-carbide-industry_4285.pdf as on 10/12/2024 (Annexure – 12 - page 15 para 2.3)

3. **KSPCB has overlooked the NGT court order and has given the consent letter to Carborundum Universal limited at Nalukettu, Koratty to use Petcoke as raw material despite the absence of Flue Gas Desulphurization System. KSPCB in its counter states, “there is no separate chimney to expel fumes produced from the furnace⁴”. The absence of industrial stack and scrubber system in the Acheson furnace (whereas pet coke burns in the Acheson furnace) causes green gases emission. KSPCB has not ensured that the whether factory follows the guidelines or not and yet KSPCB has grand consent letter despite the absence of the requirements and the standing case against the plant. (Annexure –1 & 3)**

4. **Petcoke must not be allowed to be used in the production of Silicon Carbide since it is not indispensable raw material and that is highly polluting factor and there are multiple substitutes. While petroleum coke (petcoke) is a commonly used raw material in the production of silicon carbide (SiC) via the Acheson process, it is not an indispensable component. Several alternative carbon sources can effectively replace petcoke, and various factors contribute to its non-essential status.**

➤ **Alternative Carbon Sources**

• **Coal and Charcoal:**

Other carbonaceous materials such as coal and charcoal can serve as substitutes for petcoke. These materials can be used in the same chemical reactions to produce SiC, demonstrating that petcoke is not the only viable option for carbon input.

• **Biomass-derived Cokes:**

Cokes derived from biomass are increasingly being explored as sustainable alternatives. These sources can provide the necessary carbon without the environmental drawbacks associated with fossil fuels like petcoke.

• **Carbon Black:**

Carbon black, a material produced from the incomplete combustion of hydrocarbons, can also be utilized as a reducing agent in SiC production, further diversifying the options available beyond petcoke.

⁴ Environmental Engineer, Sixth Respondent. (2024, March 12). *Report filed as per order dated 08-02-2024, National Green Tribunal, Southern Zone, Chennai Circuit Bench, Application No. 39 of 2024 (SZ)*. Annexure -4 page 3, para 6)

5. In the consent letter (FILE NO. : KSPCB/TS/ICO/10041755/2024 Date of issue : 09-01-2024) 2.6 states that “Ordinary coke shall be used instead of Pet coke⁵”. And yet they factory is using Pet coke as raw material. Therefore, Pet coke must not be used or it must be treated (degasification/dehydrogenation process) before it is used as raw material for SIC production. “According to the invention, the treatment for removing hydrogen from the Source of carbon is carried out before it is mixed with the source of silicon”⁶. (Annexure – 4 & 2)
6. The A THE AIR (Prevention and Control of Pollution) ACT, 1981-chapter 4 para 5. (iv) states that “chimney, wherever necessary, of such specifications as the State Board may approve in this behalf shall be erected or re-erected in such premises⁷”. The consent letter - 2.7 Stack with adequate stack height shall be provided to keep the emission quality to the standards. They don’t have industrial stack and yet KSPCB has given the renewal at all intervals including when the case was going on. (5 Annexure & Annexure -4)
7. KSPCB has not taken any action to follow up furnace plant and their silence is a consent for Carborundum Universal Ltd permission to cause pollution. The explosion in Carborundum Universal limited plant at the kalamassery, Kochi is another example “This consent is granted based on the particulars and affidavit submitted by the Entrepreneur and any violation/non-compliance/submission of false information will lead to cancellation of consent and stringent action against the applicant and occupier⁸” and yet no substantial action is taken to mitigate the issues. (Annexure - 4 & 6)

⁵ Environmental Engineer, Report filed as per order dated 08-02-2024. Annexure, 4 page 4 & 13

⁶ Aleonard, P., et al. (2014). *Process for manufacturing silicon carbide*. United States Patent Application Publication No. US 2014/0140915 A1.

<https://patentimages.storage.googleapis.com/ed/04/82/f333858e0a4923/US20140140915A1.pdf> as on 10th December 2024. (Annexure – 2-page 2-3 para 0041)

⁷ Government of India. (1981). *The Air (Prevention and Control of Pollution) Act, 1981* [No. 14 of 1981, 29th March, 1981]. Retrieved from Central Pollution Control Board website:

<https://cpcb.nic.in/air-pollution/>

⁸ Environmental Engineer, Report filed as per order dated 08-02-2024. Annexure - 4, Pg 13 para 2.4

8. **Absence of Enclosed and insulated Premise for operation of the furnace:** - 2013 consent letter para 4.7 states that the operations should be done in an insulated manner. “*All operations likely to produce dust or noise shall be carried out within closed and insulated premises*” But they are having the furnace in an open hall without any scrubber system and conventional pollution control measures. (Annexure - 4)
9. **Carbon dioxide (CO₂) and methane (CH₄) are emitted during the production of silicon carbide.** Petroleum coke is utilized as the carbon source during silicon carbide production. Approximately 35% of the carbon is retained (reclaimed) within the silicon carbide, and the remaining carbon is converted to CO₂ and CH₄. The presence of hydrogen-containing volatile compounds in the petroleum coke may cause formation and emission to the atmosphere of CH₄⁹. (Annexure – 13)
10. **The Figure 2 shows the emission of gases.** (Annexure 2)

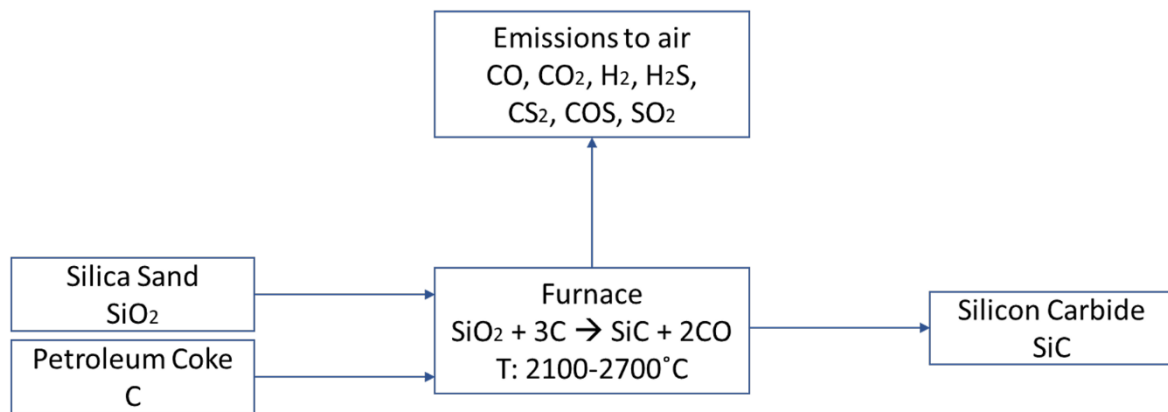


Figure 2 - Simplified diagram of silicon carbide production

11. **There is an alarming level of Emission various kinds of pollutant gases when 20 tonnes of Petroleum Coke undergo Thermal Decomposition in the Acheson furnace. In fact, if we place Ambient air quality system near the furnace then we will get alarming levels of emission. Based on typical emission factors for petroleum coke, the following gases and their quantities can be expected:**

- **Carbon Dioxide (CO₂):**
 - Quantity: 50 tonnes
 - Emission Factor: 2.5 tonnes per tonne of petcoke

⁹ U.S. Environmental Protection Agency. (2009, January 22). *Technical support document for the silicon carbide production sector: Proposed rule for mandatory reporting of greenhouse gases*. Office of Air and Radiation. Retrieved from <https://www.epa.gov/sites/default/files/2015-03/documents/subpartbb-std-siliconcarbide.pdf> as on 10/12/2024 (Annexure 13 Page 2 para 2.1)

- **Carbon Monoxide (CO):**
 - Quantity: 10 tonnes
 - Emission Factor: 0.5 tonnes per tonne of petcoke
- **Volatile Organic Compounds (VOCs):**
 - Quantity: 2 tonnes
 - Emission Factor: 0.1 tonnes per tonne of petcoke
- **Hydrogen (H₂):**
 - Quantity: 1 tonne
 - Emission Factor: 0.05 tonnes per tonne of petcoke
- **Sulfur Dioxide (SO₂)**
 - Quantity: 0.4 tonnes (400kg)
 - Emission Factor: 0.02 tonnes per tonne of petcoke

These data show the level of emission and subsequent pollution. (Annexure – 10)

- 12. Petcoke is only source of carbon but it is highly inflammable fuel and it can combust at flash point of 400 -700c whereas the furnace reaches up to 2500c therefore, Petcoke will burn. KSPCB has not done impartial scrutiny to verify to see whether the plant is using it as raw material or as fuel. (Annexure - 7)**
- 13. Ignition and burning and subsequently violating the Green Tribunals order: - Petcoke, or petroleum coke, is indeed burned as a fuel in the manufacturing of silicon carbide (SiC). It serves as both a feedstock and a source of heat in the production process. The high carbon content of Petcoke, which can exceed 90%, makes it an effective fuel for generating the necessary temperatures in industrial furnaces used for SiC synthesis. Therefore, it is used as both as fuel and source of raw material in the pretext of only as raw material¹⁰. (Annexure -7)**
- 14. The ambient air quality monitoring system installed at Carborundum Universal limited plant at Nalukettu shows peak sulphur content as high as 194 which is alarmingly high. As per National Ambient Air Quality Standards Central Pollution Control Board Notification New Delhi, the 18th November, 2009 Sulphur Dioxide (SO₂), µg/m³ for 24 hours is 80. (Annexure –10)**

¹⁰ <https://www.perplexity.ai/search/is-petcoke-is-burned-as-a-fuel-jGagUnSEQi..kGBmkycD4w> as on 7th December 2024 (Annexure 7)

15. The SiC manufacturing process produces toxic gases and releases heavy metal particles that present environmental and health risks. Further, the SiC ingot product requires additional processing, including chemical purification and grinding to a particle size of 1–10 µm; the processing and handling of these particles have been reported to cause respiratory damage and lung cancer¹¹. (Annexure – 8 & 17)
16. We experience foul smell of So₂ and Hydrogen Sulfide (H₂S) which is seen in the ambient air quality monitoring system. “The H₂S emission and other volatile components can cause several odour problems even in the lowest concentrations and have to be controlled according to the environmental rules. The coke also contains additional polycyclic aromatic hydrocarbons (PAHs) and heavy metals in small amounts which also needs to be addressed¹²”. On 9th of August 2024 representatives from KSPCB from Thrissur branch had come and made first-hand examination of the situation and saw the absence of the real time air quality monitoring system and they experienced the smell. RTI of KSPCB and Environment engineer also accepted the fact of foul smell. (Annexure – 12 & 15)
17. The Health Inspector and the local residents of Nalukettu have clearly stated the existing issues of smell and the pollution attached to it and it was published in Amrita TV documentary. But the present health department is not accepting the existing issues of smell, pollution and the health concerns. Water cooling of the furnace causes huge amount of pollution since it produces Hydrogen Sulfide (H₂S). Inf act there is history of water pollution in the neighbouring water body and subsequent death of fish and health concerns. The local residents made a serious issue on the matter. All those who approach the company are given threats or luring and false job offers and money. (Annexure – 15)

¹¹ National Science Foundation. (2022, October). *A novel, low-cost sustainable process to produce silicon carbide: Catalyzing commercialization*. Chemical Engineering Progress. Retrieved from <https://www.aiche.org/sites/default/files/cep/20221013.pdf> as on 10/12/2024. (Annexure -8)

¹² Xavier, C., & Oliveira, C. (2021). *Decarbonisation options for the Dutch silicon carbide industry*. PBL Netherlands Environmental Assessment Agency; TNO. The Hague, Netherlands. PBL Publication Number: 4285. TNO Project Number: 060.33956 / TNO 2021 P10837. Retrieved from https://www.pbl.nl/sites/default/files/downloads/pbl-2021-decarbonisation-options-for-the-dutch-silicon-carbide-industry_4285.pdf as on 10/12/2024 (Annexure – 12 - page 15 para 2.3)

18. All these years Carborundum Universal Limited at Nalukettu, Koratty has been operating furnaces without necessary pollution safety measures. It has been a serious violation of the pollution act. The negligence of the various departments has made their way easier to mint money at the cost of the lives of the neighbourhood.
19. Calcinated Petcoke is supposed to be use as feed stack but they are using the raw Petcoke without proper scrubber system and effluent plant and industrial stack. Before The National Green Tribunal Principal Bench, New Delhi - Original Application No. 138/2019 (I.A. No. 65/2019, I.A. No. 686/2019 & I.A. No. 762/2019 - states that (Annexure - 1)
20. There must be temporary stoppage or stay order for usage of Petcoke in the furnace since till date they do not have the required pollution imitating systems and that we are suffering due to this human right violation. This is a serious concern for the people who reside in a radius of 3 - 5 KM. Kindly find the signed memorandum of immediate neighbours.
21. The 5th respondent has stated that Volzhsky Abrasive Works Russia is highest producer of SIC but they use the necessary pollution control measures. They have six huge industrial stacks and with pollution control system. Their plant is not close to the residential area. Whereas The 5th respondent's plant is aware of the process required for safty and that the plant is in the heart of thousands of families. There are few lakhs of people within the radices of 5 km. These people are the victims of pollution caused by the Carborundum universal limited plant at Nalukettu, Koratty because the furnace is fired in an open area and not in a enclosed and insulated area. In fact Petcoke is burning just like in the video. The Raw material is used in an inappropriate manner resulting the burning of Petcoke and subsequent burning. The fusion take place only whatever is close to the inner core of the furnace and rest is burning to give necessary heat for the fusion. As a matter of fact, the outer area is burning and it has no inert gases to arrest the burning of the Petcoke. Therefore, the word raw material is a manipulated term. (Annexure – 9)

22. **The 5th respondent has shown the data of emission on a monthly average basis and therefore, it looks very low. But when they use the water cooling the pollution level is very high with foul smell. Their data collection is not accurate. It's a manipulated data since the ambient quality machine is kept much away from the location of furnace and that they are using powerful blowers to redirect the polluted gases so that the ambient quality machine might not get the accurate data. We have sent the complaint to the central pollution control Delhi. (Annexure- 11)**
23. **The data given by the plant is based on monthly basis therefore it is shown as very low but it needs to point out the peak point of pollution and the least. Most of the time the ambient air quality monitoring system is dismantled from time to time and yet the display is on. (Annexure- 11)**
- 24 The 6th respondent has mentioned that they are flaring the Gases. They are flaring the gases openly without any proper permission and procedures. The RTI states that they do not have the permission to flare the gases. (Annexure- 16)
- 25 The International Agency for Research on Cancer is an intergovernmental agency forming part of the World Health Organization of the United Nations, whose role is to conduct and coordinate research into the causes of cancer, has identified the incidents of cancer in those who are associated with silicon carbide production in the Acheson furnace. The entire book has given a detailed explanation of the incidents of cancer as result of production of SIC from Petcoke. Some case studies have evaluated biological samples from workers and the studies of Dufresne et al. (1993, 1995) are particularly relevant regarding exposures to silicon carbide fibres in the Canadian silicon carbide industry. Dufresne et al. (1993) reported a concentration of 39 300 fibres/mg of dry lung tissue for fibres longer than 5 µm (mean diameter, 0.49 µm; mean length, 11 µm) and a concentration of 105 243 fibres/mg of dry lung tissue for fibres shorter than 5 µm (mean diameter, 0.22 µm; mean length, 2.86 µm) in the lung parenchyma of a retired silicon-carbide plant worker (see Table 1.8). The worker was diagnosed with pneumoconiosis and lung cancer and had been exposed for 42 years near an Acheson furnace¹³. (Annexure- 17)

¹³ International Agency for Research on Cancer, & World Health Organization. (2017). *Some Nanomaterials And Some Fibres Volume - III IARC Monographs On The Evaluation Of Carcinogenic Risks To Humans*. IARC Monographs on the Evaluat. <https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Some-Nanomaterials-And-Some-Fibres-2017> Pg 260

- 25 The carcinogenic risk associated with exposure to silicon carbide fibres has been investigated in two cohort studies of occupational exposure among workers using the Acheson process in silicon-carbide manufacturing plants. This process is characterized by multiple exposures, among them fibrous and non-fibrous silicon carbide, quartz, and cristobalite. The first cohort study included workers in the Canadian silicon- carbide manufacturing industry. An excess of mortality from lung cancer was observed in comparison with the general population. Mortality from mesothelioma was not reported for this cohort. In the second cohort, the incidence of lung cancer was investigated among workers in the Norwegian silicon-carbide manufacturing industry. In a series of studies, the most informative analysis was limited to long-term workers with at least 3 years of employment, and was based on a detailed job–exposure matrix taking into account total and respirable dust, non-fibrous and fibrous silicon carbide, quartz, and cristobalite. Overall, the incidence of lung cancer was increased, with the highest risk for workers in the furnace department who were believed to have the highest exposures to fibrous silicon carbide and crystalline silica dust¹⁴. (Annexure- 17)
- 26 There are several cases of Lung cancer for the people who worked in the factory and those who live within 2 km radius of the factory. Therefore, Petcoke must not be allowed in the production of the SIC in INDIA since it is not the only option for making SIC.

¹⁴ International Agency for Research on Cancer & World Health Organization, 2017, p. 303.