The following information was generated from the Hazardous Substances Data Bank (HSDB), a database of the National Library of Medicine's TOXNET system (http://toxnet.nlm.nih.gov) on July 20, 2014.

Query: Records containing the term 7713

1 - HSDB
NAME: GRAPHITE
HSN: 7713
RN: 7782-42-5

HUMAN HEALTH EFFECTS:

HUMAN TOXICITY EXCERPTS:
/SIGNS AND SYMPTOMS/ Occupational diseases--carboconioses and dust bronchitis that occur in workers engaged in graphite industry may be attributed to preceding diseases conducive to the development of lung carcinoma...[Gladkova EV, Popova TB; Terapeviticheski Archiv 62 (10): 53-7 (1990)] **PEER REVIEWED**

/CASE REPORTS/ Six hundred and five cases of graphite pneumoconiosis have been reported in the literature. In 39 cases the diagnosis was based on or supported by autopsy or lung biopsy results. Only 14 of the 39 cases were presented with relatively complete documentation as to details about dust exposure. Only one of these completely documented cases suggested that nearly pure graphite may cause graphite pneumoconiosis. ...[Hanoa R; Scand J Work Env Hlth 9 (4): 303-14 (1983)] **PEER REVIEWED**

/CASE REPORTS/ Mixed dust pneumoconiosis caused by long-term occupational exposure to graphite dust is a rare disease. Only a few cases of graphite pneumoconiosis have been reported in literature, and these were usually diagnosed post mortem. /This/ report is of an 80-year-old male patient who had worked in an iron foundry for 20 years and whose work had entailed regular contact with ground graphite and foundry vapors. Chest x-rays revealed both a reticular and nodular pattern in the lung, moderate apical distractions and pleural scarring, all of which were confirmed by high-resolution computed tomography. Bronchoalveolar lavage and transbronchial biopsies were also consistent with mixed dust pneumoconiosis, and due to the long-term dust exposure, graphite pneumoconiosis was strongly suspected. To confirm this diagnosis, the chemical composition of the dark granules in the semi-thin histological sections of the transbronchial biopsies were analyzed using laser microprobe mass spectroscopy. The mass spectra of these black particles were consistent with those of natural graphite powder. Comparative analyses of normal lung tissue did not produce similar spectral patterns. /It was concluded/ that histology and cytology does not always suffice to confirm a diagnosis of graphite pneumoconiosis, because black particles are also found in conditions resulting from other exposures, such as heavy smoking or coal mining. Analysis of the composition of particles deposited in the lung tissue offers more precise information, which can be used as evidence in occupational and forensic medicine. Laser microprobe mass spectroscopy can assess the mineral dust load in lung samples.[Domej W et al; Wiener Klinisch Wochenschrift 114 (5-6): 216-21 (2002)] **PEER REVIEWED**

/CASE REPORTS/ Inhalation of graphite dust can cause lung disease, mostly in the form of mixed-dust pneumoconiosis in individuals working in the metallurgic industry or graphite mines. The morphologic landmark of graphite pneumoconiosis is nonasbestos ferruginous bodies with a black graphite core. In the sputum of an 81-year-old male, characteristic nonasbestos ferruginous bodies were identified. The occupational history confirmed long exposure to natural graphite in metallurgy. By the identification of typical ferruginous bodies, the screening of sputum smears may confirm the clinical and radiologic suspicion of pneumoconiosis and may contribute to determining its causes.[Mazzucchelli L et al; Acta Cytologica 40 (3): 552-4 (1996)] **PEER REVIEWED**

/CASE REPORTS/ ... Computed tomographic (CT) scans obtained in 48 patients with a history of occupational exposure to dust and radiographic changes suggestive of pneumoconiosis were retrospectively reviewed.
Histologic samples were available in 22 cases. The most common CT features were as follows: in 21 arc welders, ill-defined micronodules concentrated in the centrilobular regions (n = 15); in 19 graphite workers, small nodular hyperattenuating areas (n = 17) (ill defined or well defined, corresponding to macular lesions along the walls of bronchioles and nodules, respectively), interlobular septal thickening (n = 11), and large hyperattenuating areas (n = 10); in aluminum pneumoconiosis, predominant reticular (n = 2), nodular (n = 2), and upper-lobe fibrosis (n = 2); and in lead-iron pneumoconiosis, multilobular ground-glass attenuation and consolidation with shrinkage (corresponding to marked intra-alveolar desquamation and multinucleated giant cells with mural mononuclear cell infiltrate). Predominant findings are characteristic in each type of pneumoconiosis and are depicted at thin-section CT. [Akira M; Radiology 197(2): 403-9 (1995)] **PEER REVIEWED**


/CASE REPORTS/ A rare case of turbuloma with pneumoconiosis (Graphite lung) is reported. A 62-year-old man was admitted to hospital for diagnosis of a rapidly growing coin lesion in the right lung (S8). He had worked for 42 years in a foundry and given a diagnosis of pneumoconiosis (Graphite lung). Because transbronchial lung biopsy and percutaneous needle aspiration biopsy were not diagnostic, the right lower lobe was partially resected. Histological examination revealed the presence of caseous necrosis in a solitary mass. Therefore, it is important to consider turbuloma in the differential diagnosis of a coin lesion in patients with pneumoconiosis. [Sakurada T et al; Nihon Kybu Shikkan Gakkas Zasshi 33 (3): 332-5 (1995)] **PEER REVIEWED**


/CASE REPORTS/ This is a report on a male patient of 71 years of age who had been a graphite mill worker for about 14 years. Despite respiratory insufficiency he was rejected in 1985 as an applicant for being recognized as a victim of a professional disease, because the radiologically visible changes in the lung were only discrete. Perbronchial lung biopsy was performed in January 1990 as his dyspnea increased. Histological examination revealed graphite dust disease of the lung. Asteroid bodies in multinucleated giant cells were an unusual finding. Energy-dispersing x-ray microanalysis proved that the so-called graphite dust disease lung was actually a type of mixed dust pneumoconiosis. [Stein R, Wockel W; Pneumologie 45 (5): 333-6 (1991)] **PEER REVIEWED**


/CASE REPORTS/ A case of carbon pneumoconiosis is described and discussed. A man, aged 60, who had been turning and grinding synthetic graphite bars for 17 years, developed pneumoconiosis, Category 3. In conjunction with others previously published, this case confirms that pneumoconiosis can be caused by "nearly pure" carbon of low ash content and a wide range of particle size after long exposure to synthetic graphite or carbon black dust. [Lister WB; Br J Indust Med 18 (2): 114-116 (1961). Available from, as of April 3, 2012: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1038101 ] **PEER REVIEWED**

/CASE REPORTS/ A patient with silicosis and progressive dyspnea on exertion is described in whom open lung biopsy revealed active chronic inflammation with many macrophages filling alveolar spaces. Because of the extensive involvement by the disease of small air spaces, bilateral whole lung lavage was performed. The lung lavage effluent was striking in its blackish brown color. It was composed predominantly of macrophages containing silica, silicates, and graphite. Particles in the tissue and lavage were analyzed using scanning electron microscopy and energy dispersive X-ray analysis. The dry weight of the material removed was approximately 25 g, of which an estimated 135 mg was silica. The procedure resulted in immediate symptomatic improvement in the patient. Although his pulmonary function did not change significantly, it is hoped that removal of this material will improve his long-term prognosis. [Mason GR et al; Am Rev Resp Dis 126 (6): 1102-7 (1982)] **PEER REVIEWED**


/CASE REPORTS/ Brain abscess can develop at the site of retained intracranial foreign bodies many years after the injury. This report describes a 6 1/2-year-old child who presented with recurrent severe headaches and a focal seizure of the right upper extremity. Skull X-ray was normal. Computed tomography of the head showed a mass in the left temporoparietal region with a central area of high density and contrast enhancement, thought to be a neoplasm. The mass was seen on the radionuclide brain scan and was avascular on angiography. Craniotomy revealed a foreign body granuloma with a small abscess cavity and a retained piece of pencil graphite. No one in the

/EPIDEMIOLOGY STUDIES/ A cohort of workers from a graphite mine in Sri Lanka was studied in 1987, 1990 and 1993. Radiographic lesions were found in 8.5%, 8.9% and 4.1% of the workers in these respective rounds. When workers with radiographic lesions were clinically examined, a total of 18 cases of graphite pneumoconiosis and seven cases of active pulmonary tuberculosis were detected in the three rounds. The prevalence of both these diseases showed a decline in 1993 when compared to 1987. This favourable situation was probably the result of dust control measures introduced in the mine after 1972. Five workers developed graphite pneumoconiosis in the course of the study. They had worked in the mine for an average of 22.6 years. The right lung appeared to be more vulnerable than the left.[Uragoda CG; Occup Med 47 (5): 269-72 (1997)] **PEER REVIEWED** <ahref=http://www.ncbi.nlm.nih.gov/pubmed/9302808?dopt=Abstract target=new>PubMed Abstract

/EPIDEMIOLOGY STUDIES/ Graphite electrode manufacturing workers are exposed to coal tar and its volatiles containing a variety of polycyclic aromatic hydrocarbons (PAH), silica and graphite dusts, and asbestos. To investigate mortality from cancer and other diseases among workers in a graphite electrode production plant in Italy, a total of 1291 males actively employed between 1 January 1950 and 31 December 1989 who had worked at the plant for at least one year were studied. The follow up extended from 1950 to 1997. Standardized mortality ratios (SMR) and their 95% confidence intervals (CI) were computed using mortality rates for the Italian and regional male population. Excess mortality was observed for all causes (SMR 1.44, CI 1.32 to 1.56), all cancers (SMR 1.27, CI 1.07 to 1.50), liver cancer (SMR 4.19, CI 2.68 to 6.23), silicosis (SMR 66.39, CI 52.56 to 82.7), and cirrhosis and other chronic diseases of the liver (SMR 1.87, CI 1.31 to 2.59) in comparison with the national male population. When regional rates were used to calculate the number of expected deaths, SMRs remained higher for silicosis (SMR 57.32, 42.11 to 76.22), and liver cancer (SMR 2.57, 1.57 to 3.97). Mortality from silicosis was increased in workers hired at young ages (< 25 years, SMR 81.79; 25-34 years, SMR 82.73), and in workers aged < 45 at death (SMR 333.3, CI 159.8 to 613). Mortality from liver cancer increased threefold (SMR 3.11, CI 1.78 to 5.05) in workers with more than 10 years of employment at the plant during the manufacture of Karbate products. Results support the association between excess mortality from silicosis and occupational exposure to siliceous sands experienced during graphite electrode manufacturing. The observed excess mortality from liver cancer is compatible, to some extent, with exposures that may have occurred during the manufacture of phenolic and furfuryl resins treated products, although a role of lifestyle factors and viral infections cannot be excluded.[Merlo DF et al; Occ Environ Med 61 (2): e9 (2004)] **PEER REVIEWED** <ahref=http://www.ncbi.nlm.nih.gov/pubmed/14739393?dopt=Abstract target=new>PubMed Abstract Full text: <ahref=https://www.ncbi.nlm.nih.gov/pmc/?term=PMC1740703 target=new>PMC1740703

/EPIDEMIOLOGY STUDIES/ ... A historical cohort study was carried out of 1006 male workers employed for at least 1 year between 1945 and 1971 in a carbon (graphite) electrode production plant in central Italy, who were followed up for mortality between 1955 and 1996. The ratio of observed to expected deaths (standardised mortality ratios, SMRs) was computed from both national and (for the period 1964-96) regional age and period specific mortalities. A multivariate Poisson regression analysis was performed to investigate the relative risk (RR) of death according to duration of employment and time since first employment in the factory. A total of 424 workers had died, 538 were still alive, and 44 were lost to follow up. Mortalities from all causes, all cancers, and respiratory tract cancer were in line with the regional figure. An excess was found over the expected deaths from skin cancer including melanoma (SMR 3.16, 95% confidence interval (95% CI) 0.65 to 9.23) and from non-neoplastic respiratory diseases (SMR 1.58, 95% CI 1.16 to 2.11). Poisson regression analysis including age as a covariate showed an increased risk of dying from gastric cancer with increasing duration of employment, and an increase in the RR of dying from lung cancer and from non-neoplastic respiratory diseases with increasing time since first employment, although the linear trend was not significant. This study supports previous findings that working in the carbon electrode manufacturing industry may not increase the risk of dying from respiratory cancer. However, a possible association with non-malignant respiratory diseases cannot be excluded.[Donato F et al; Occup Environ Med 57 (7): 484-7 (2000)] **PEER REVIEWED** <ahref=http://www.ncbi.nlm.nih.gov/pubmed/10854502?dopt=Abstract target=new>PubMed Abstract Full text: <ahref=https://www.ncbi.nlm.nih.gov/pmc/?term=PMC1739985 target=new>PMC1739985

/SURVEILLANCE/ A retrospective, observational study was conducted in order to gather data on cases of pneumoconioses treated at the outpatient clinic of the State University at Campinas Hospital das Clínicas between 1978 and 2003. Individuals diagnosed with pneumoconiosis, based on their occupational history and on chest X-ray findings of abnormalities consistent with interstitial lung disease involving the parenchyma, in accordance with the 1980 and 2000 recommendations of the International Labour Organization, were included in the study. ... A total of
1147 cases of pneumoconiosis were identified (1075 in males and 72 in females): 1061 cases of silicosis (92.5%); 51 cases of mixed-dust pneumoconiosis (4.45%); 15 cases of asbestosis (1.31%); 13 cases of phosphate rock-related pneumoconiosis (1.13%); and 7 cases of other types of pneumoconiosis (0.6%), including those related to exposure to coal, graphite and hard metals...[Lido AV et al; Jornal Brasileiro de Pneumologia 34 (6): 367-72 (2008)] **PEER REVIEWED** <ahref=http://www.ncbi.nlm.nih.gov/pubmed/18622503?dopt=Abstract target=new>PubMed Abstract

/SURVEILLANCE/ A study of underground miners in a graphite mine in Sri Lanka was conducted in 1987. Twelve (3.4%) of the 340 workers examined had radiographic lesions suggestive of graphite pneumoconiosis. In comparison, a survey carried out in another mine in Sri Lanka in 1972 showed that 63(18.3%) of the 344 workers examined had similar lesions. Though the two surveys were comparable, they were conducted in two different mines...[Uragoda CG; J Trop Med Hyg 92 (6): 422-4 (1989)] **PEER REVIEWED**

/SURVEILLANCE/ 344 workers in a large mine in Ceylon were investigated for pulmonary lesions; 22.7% of them had radiographic abnormalities, which included small rounded and irregular opacities, large opacities, and significant enlargement of hilar shadows. They had worked considerably longer in the industry and were, on average, older than the rest. Only 19.2% of the affected workers had respiratory symptoms, of which dyspnea and cough were the most frequent. Digital clubbing was seen in 21.9%. UR-[Ranasinha KW, Uragoda CG; Brit J Industr. Med 29: 178-183 (1972). Available from, as of April 3, 2012: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1009396 ] **PEER REVIEWED**

/SURVEILLANCE/ Coke and graphite dust absorbs polycyclic aromatic hydrocarbons, including benz[a]pyrene in concentrations exceeding maximum permitted levels. Screening of 746 graphite workers followed by clinical examination established increased incidence of diseases of the upper respiratory tract (chronic rhinitis pharyngitis, laryngitis, etc.), bronchi and lungs (chronic bronchitis or pneumonia) and skin (hyperkeratosis, naevi, etc.). Among respiratory diseases were hypertrophic laryngitis, papillomatous bronchitis and angiofibroma of the larynx which are now considered to be precancer. Cancer epidemiologic studies referred graphite workers to a group of high risk of cancer.[Kasparov AA et al; Voprosy Onkoloozii 35 (4): 445-50 (1989)] **PEER REVIEWED**

/OTHER TOXICITY INFORMATION/ Carcinogenic hazards for workers of certain plants of steel, asbestos, oil-producing, oil-refining and chemical industries were studied. Potential carcinogenic hazards for workers of graphite industry conditioned mainly by coke and graphite dust adsorbed polycyclic hydrocarbons, particularly, benzo[a]pyrene made the case for cancer epidemiologic studies which were carried out at some of those plants in the 70s. Exposure to polycyclic hydrocarbons adsorbed on industrial dust was shown to significantly increase the incidence of lung cancer. [Glakova EV; Voprosy Onkologii 36 (4): 415-20 (1990)] **PEER REVIEWED**


EMERGENCY MEDICAL TREATMENT:

EMT COPYRIGHT DISCLAIMER: The information contained in the Truven Health Analytics Inc. products is intended as an educational aid only. All treatments or procedures are intended to serve as an information resource for physicians or other competent healthcare professionals performing the consultation or evaluation of patients and must be interpreted in view of all attendant circumstances, indications and contraindications.

The use of the Truven Health Analytics Inc. products is at your sole risk. These products are provided "as is" and "as available" for use, without warranties of any kind, either express or implied. Truven Health Analytics Inc. makes no representation or warranty as to the accuracy, reliability, timeliness, usefulness or completeness of any of the information contained in the products. Additionally, Truven Health ANALYTICS INC. makes no representation or warranties as to the opinions or other service or data you may access, download or use as a result of use of the Truven Health ANALYTICS INC. products. All implied warranties of merchantability and fitness for a particular purpose or use are hereby excluded. Truven Health Analytics Inc. does not assume any responsibility or risk for your...
use of the Truven Health Analytics Inc. products.

The following Overview, *** IRRITANTS ***, is relevant for this HSDB record chemical.

LIFE SUPPORT:
o  This overview assumes that basic life support measures have been instituted.

CLINICAL EFFECTS:
0.2.1 SUMMARY OF EXPOSURE
0.2.1.1 ACUTE EXPOSURE
A) USES: Irritants are a broad category of substances that cause inflammation and swelling but not cellular death or tissue damage, while corrosives cause cellular damage and death. Whether a substance is labeled a "corrosive" or "irritant" typically depends on several factors including concentration, viscosity, pH, molarity, oxidation-reduction potential, complexing affinity toward bivalent ions, etc. It can be difficult to determine whether a substance is a corrosive or irritant and the distinction may be concentration-dependent.
B) TOXICOLOGY: Irritants cause inflammation and swelling with local tissue irritation; this can lead to rhinorrhea, cough, shortness of breath, bronchospasm, irritation of oral mucous membranes and esophagus, and rarely upper airway swelling or acute lung injury.
C) WITH POISONING/EXPOSURE
1) MILD TO MODERATE TOXICITY: Irritants may cause swelling, redness, and pain at any site, especially at mucous membranes. The mouth, nose, and eyes are commonly affected. After inhalation, cough, tachypnea, and wheezing are common. With ingestion, nausea, vomiting, and diarrhea are common. With dermal exposure, redness, swelling, and pain may occur.

0.2.20 REPRODUCTIVE HAZARDS
A) Pregnant female rats were exposed to N-methylpyrrolidone. Exposed offspring had normal motor function, activity levels, and low-level learning abilities. On higher-level learning tests, their performance was impaired compared to unexposed offspring.

0.2.21 CARCINOGENICITY
0.2.21.2 HUMAN OVERVIEW
A) Development of sinonasal neoplasms has been associated with exposure to wood dust and other irritants.

LABORATORY:
A) No specific lab tests are indicated.
B) Patients with severe hypoxia may require pule oximetry/ABG monitoring and a chest radiograph.
C) Patients with large ingestions or more severe symptoms (stridor, inability to swallow, pain on swallowing, persistent vomiting) should have endoscopy to evaluate for upper GI corrosive burns.

TREATMENT OVERVIEW:
0.4.2 ORAL EXPOSURE
A) MANAGEMENT OF MILD TO MODERATE TOXICITY
1) Treatment consists of predominantly symptomatic and supportive care. For patients with ingestion, dilution with 4- to 8 ounces of fluid may decrease symptoms. Neutralization is not recommended.
B) MANAGEMENT OF SEVERE TOXICITY
1) Although irritants by definition should not produce tissue damage, it is almost impossible to assure that a particular substance under a particular set of circumstances could not act as a corrosive instead of an irritant. Patients with severe symptoms after ingestion of an irritant should be evaluated with upper GI endoscopy for possible corrosive injury with mucous membrane damage.
C) DECONTAMINATION
1) PREHOSPITAL: The patient should be removed from the exposure; remove contaminated clothing and wash exposed skin; irrigate exposed eyes. Emesis is NOT indicated due to the irritant nature of these agents. Activated charcoal is NOT recommended.
2) HOSPITAL: Dermal or eye exposures should be irrigated as above. For patients with ingestion, dilution with 4 to 8 ounces of fluid may decrease symptoms. Emesis is NOT indicated due to the irritant nature of these agents. Charcoal is NOT recommended.
D) AIRWAY MANAGEMENT
1) Rarely, patients with signs and symptoms of respiratory failure and severe hypoxia may required intubation for acute lung injury.
E) ANTIDOTE
1) None
F) ENHANCED ELIMINATION PROCEDURE
1) There is no role for hemodialysis in irritant exposure.
G) PATIENT DISPOSITION
1) HOME CRITERIA: Patients with inadvertent small exposures who have no more than mild symptoms can be observed home.
2) OBSERVATION CRITERIA: Patients with deliberate exposures or moderate to severe symptoms should be referred to a healthcare facility for evaluation and treatment. They should be observed in the ED until asymptomatic.
3) ADMISSION CRITERIA: Patients with persistent symptoms, upper GI burns, persistent bronchospasm or hypoxia should be admitted.
4) CONSULT CRITERIA: Contact your local poison center or a medical toxicologist for any patient with severe toxicity or in whom the diagnosis is unclear.

H) PITFALLS
1) Failure to monitor patients who are at risk for delayed-onset pulmonary edema and acute lung injury.
2) Failure to recognize corrosive rather than irritant exposure.

I) DIFFERENTIAL DIAGNOSIS
1) Occupational or environmental asthma, heart failure, allergic reactions, caustic exposure.

0.4.3 INHALATION EXPOSURE
A) Patients should be removed from exposure into fresh air and monitored for respiratory distress. Oxygen should be administered as needed for hypoxia. Treat bronchospasm with inhaled beta-2 agonist and steroids. Patients with acute lung injury may require intubation for hypoxia; these patients should be managed with lung-protective ventilation techniques.

0.4.4 EYE EXPOSURE
A) Irrigate eyes with copious amounts of water or saline; the pH of the ocular cul de sac can be evaluated and the eyes should be irrigated until symptoms improve and this pH is neutral.

0.4.5 DERMAL EXPOSURE
A) OVERVIEW
1) Skin should be thoroughly irrigated. Contact dermatitis may arise after repeated exposure to irritants.

RANGE OF TOXICITY:
A) TOXICITY: The range of toxicity varies among the many substances categorized as irritants. Toxicity depends on a number of factors including concentration, mechanism of action, pH, free acidity and alkalinity, molarity and oxidation-reduction potential.

EMERGENCY MEDICAL TREATMENT:
EMT COPYRIGHT DISCLAIMER:
The information contained in the Truven Health Analytics Inc. products is intended as an educational aid only. All treatments or procedures are intended to serve as an information resource for physicians or other competent healthcare professionals performing the consultation or evaluation of patients and must be interpreted in view of all attendant circumstances, indications and contraindications. The use of the Truven Health Analytics Inc. products is at your sole risk. These products are provided "as is" and "as available" for use, without warranties of any kind, either express or implied. Truven Health Analytics Inc. makes no representation or warranty as to the accuracy, reliability, timeliness, usefulness or completeness of any of the information contained in the products. Additionally, Truven Health ANALYTICS INC. makes no representation or warranties as to the opinions or other service or data you may access, download or use as a result of use of the Truven Health ANALYTICS INC. products. All implied warranties of merchantability and fitness for a particular purpose or use are hereby excluded. Truven Health Analytics Inc. does not assume any responsibility or risk for your use of the Truven Health Analytics Inc. products. The following Overview, *** CARBON BLACK***, is relevant for this HSDB record chemical.

LIFE SUPPORT:
o This overview assumes that basic life support measures have been instituted.

CLINICAL EFFECTS:
0.2.1 SUMMARY OF EXPOSURE
0.2.1.1 ACUTE EXPOSURE
A) There are no well documented health hazards to humans from acute exposure to carbon black. Potential health effects are generally due to impurities adsorbed on its surface rather than to the carbon itself.
B) Carbon black may be irritating to the skin and nose, mouth, throat and respiratory tract. Contact may cause burns to skin and eyes.

0.2.4 HEENT
0.2.4.1 ACUTE EXPOSURE
A) Black pigmentation of the palpebral conjunctiva at the upper tarsal border has occurred after regular application of eye cosmetics containing carbon black. Oral mucosal lesions have been reported.

0.2.5 CARDIOVASCULAR
0.2.5.1 ACUTE EXPOSURE
A) Epidemiologic studies have revealed no unusual risk of heart disease in carbon black workers. Some evidence of electrocardiographic changes have been noted in experimental animals.

0.2.6 RESPIRATORY
0.2.6.1 ACUTE EXPOSURE
A) Respiratory tract irritation, cough, interstitial fibrosis, chronic bronchitis, changes in pulmonary function, and respiratory failure may occur.

0.2.14 DERMATOLOGIC
0.2.14.1 ACUTE EXPOSURE
A) Skin irritation and follicular coniosis may occur.

0.2.19 IMMUNOLOGIC
0.2.19.1 ACUTE EXPOSURE
A) An increase of serum IgA and decrease in IgM have been reported.

0.2.20 REPRODUCTIVE HAZARDS
A) There are no human or animal reports suggesting a teratogenic potential for carbon black.
B) At the time of this review, no data were available to assess the potential effects of exposure to this agent during pregnancy or lactation.

0.2.21 CARCINOGENICITY
0.2.21.1 IARC CATEGORY
1) IARC Classification
   a) Listed as: Carbon black
   b) Carcinogen Rating: 2B
   1) The agent (mixture) is possibly carcinogenic to humans. The exposure circumstance entails exposures that are possibly carcinogenic to humans. This category is used for agents, mixtures and exposure circumstances for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. It may also be used when there is inadequate evidence of carcinogenicity in humans but there is sufficient evidence of carcinogenicity in experimental animals. In some instances, an agent, mixture or exposure circumstance for which there is inadequate evidence of carcinogenicity in humans but limited evidence of carcinogenicity in experimental animals together with supporting evidence from other relevant data may be placed in this group.

0.2.21.2 HUMAN OVERVIEW
A) There is inadequate evidence to evaluate the carcinogenicity of carbon black to humans. IARC has determined that there is sufficient evidence that solvent extracts of carbon black are carcinogenic.
B) Carbon black may be cocarcinogenic when acting synergistically with a high fat diet and unknown carcinogens in the colon.

0.2.21.3 ANIMAL OVERVIEW
A) Lung tumors were induced by inhaled carbon black in rats, but not in mice.

0.2.22 GENOTOXICITY
A) DNA damage has occurred in mice; mutations in microorganisms have occurred in S typhimurium. At the time of this review, no data were available to assess the potential of this agent to induce chromosome aberrations.

LABORATORY:
A) No specific lab work (CBC, electrolytes, urinalysis) is needed unless otherwise clinically indicated.
B) FEV1 and FVC may be reduced. Chest x-ray findings may be normal.

TREATMENT OVERVIEW:

0.4.2 ORAL EXPOSURE
A) Due to the nature of this agent, ingestion is unlikely.

0.4.3 INHALATION EXPOSURE
A) INHALATION: Move patient to fresh air. Monitor for respiratory distress. If cough or difficulty breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Administer oxygen and assist ventilation as required. Treat bronchospasm with an inhaled beta2-adrenergic agonist. Consider systemic corticosteroids in patients with significant bronchospasm.

B) If respiratory tract irritation is present, it may be useful to monitor pulmonary function tests.

C) Patients symptomatic following exposure should be observed in a controlled setting until all signs and symptoms have fully resolved.

0.4.4 EYE EXPOSURE

A) DECONTAMINATION: Remove contact lenses and irrigate exposed eyes with copious amounts of room temperature 0.9% saline or water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist after 15 minutes of irrigation, the patient should be seen in a healthcare facility.

0.4.5 DERMAL EXPOSURE

A) OVERVIEW

1) DECONTAMINATION: Remove contaminated clothing and jewelry and place them in plastic bags. Wash exposed areas with soap and water for 10 to 15 minutes with gentle sponging to avoid skin breakdown. A physician may need to examine the area if irritation or pain persists (Burgess et al, 1999).

RANGE OF TOXICITY:

A) No health hazards have been demonstrated in humans following acute exposure to carbon black. It has, however, been recognized as a possible carcinogen to humans.

ANTIDOTE AND EMERGENCY TREATMENT:

/SRP:/ Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR if necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on the left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Poisons A and B/[Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 160] **PEER REVIEWED**

/SRP:/ Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if needed. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary ... . Monitor for shock and treat if necessary .... Anticipate seizures and treat if necessary .... For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport .... Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool .... Cover skin burns with dry sterile dressings after decontamination .... /Poisons A and B/[Currance, P.L. Clements, B., Bronstein, A.C. (Eds); Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 160] **PEER REVIEWED**

/SRP:/ Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in severe respiratory distress. Positive-pressure ventilation techniques with a bag valve mask device may be beneficial. Consider drug therapy for pulmonary edema .... Consider administering a beta agonist such as albuterol for severe bronchospasm .... Monitor cardiac rhythm and treat arrhythmias as necessary .... Start IV administration of D5W /SRP: "To keep open", minimal flow rate/. Use 0.9% saline (NS) or lactated Ringer’s if signs of hypovolemia are present. For hypotension with signs of hypovolemia, administer fluid cautiously. Watch for signs of fluid overload .... Treat seizures with diazepam or lorazepam .... Use proparacaine hydrochloride to assist eye irrigation .... /Poisons A and B/[Currance, P.L. Clements, B., Bronstein, A.C. (Eds); Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 160-1] **PEER REVIEWED**

ANIMAL TOXICITY STUDIES:

NON-HUMAN TOXICITY EXCERPTS:

/OTHER TOXICITY INFORMATION/ Small quantities of carbon suspensions in the form of graphite or India ink injected into the anterior chamber of rabbits is mostly taken up by leukocytes and by the corneal endothelium, producing essentially no signs of inflammation. Large quantities may obstruct aqueous outflow mechanically.[Grant, W.M. Toxicology of the Eye.
METABOLISM/ PHARMACOKINETICS:

ABSORPTION, DISTRIBUTION & EXCRETION:
Small quantities of carbon suspensions in the form of graphite or India ink injected into the anterior chamber of the eyes of rabbits is mostly taken up by the leukocytes and by the corneal endothelium, producing essentially no signs of inflammation. [Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 178]

PHARMACOLOGY:

ENVIRONMENTAL FATE & EXPOSURE:

NATURAL POLLUTION SOURCES:

ENVIRONMENTAL STANDARDS & REGULATIONS:

FIFRA REQUIREMENTS:
Residues of graphite are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest. Use: solid diluent, carrier. Limit: none. [40 CFR 180.910 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of March 3, 2009: http://www.gpoaccess.gov/ecfr]

Residues of graphite are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only. Use: treatment aid for seeds. Limit: none. [40 CFR 180.920 (USEPA); U.S. National Archives and Records Administration’s Electronic Code of Federal Regulations. Available from, as of March 3, 2009: http://www.gpoaccess.gov/ecfr]

Residues of graphite are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals. Use: solid diluent, carrier. Limit: none. [40 CFR 180.930 (USEPA); U.S. National Archives and Records Administration’s Electronic Code of Federal Regulations. Available from, as of February 23, 2009: http://www.gpoaccess.gov/ecfr]

ALLOWABLE TOLERANCES:
Residues of graphite are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest. Use: solid diluent, carrier. Limit: none. [40 CFR 180.910 (USEPA); U.S. National Archives and Records Administration’s Electronic Code of Federal Regulations. Available from, as of February 23, 2009: http://www.gpoaccess.gov/ecfr]

Residues of graphite are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only. Use: treatment aid for seeds. Limit: none.[40 CFR 180.920 (USEPA); U.S. National Archives and Records Administration’s Electronic Code of Federal Regulations. Available from, as of March 3, 2009: http://www.gpoaccess.gov/ecfr ] **PEER REVIEWED**

Residues of graphite are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals. Use: solid diluent, carrier. Limit: none.[40 CFR 180.930 (USEPA); U.S. National Archives and Records Administration’s Electronic Code of Federal Regulations. Available from, as of February 23, 2009: http://www.gpoaccess.gov/ecfr ] **PEER REVIEWED**

CHEMICAL/PHYSICAL PROPERTIES:

MOLECULAR FORMULA:
C **PEER REVIEWED**

COLOR/FORM:

Soft black hexagonal crystals; insol in water, acid, alkali; sol in liquid iron; density: 2.2 g/cu cm; MP: 4,489 deg C (10.3 GPA); BP: 3,825 deg C (sublimes)[Lide, D.R. CRC Handbook of Chemistry and Physics 86TH Edition 2005-2006. CRC Press, Taylor & Francis, Boca Raton, FL 2005, p. 4-56] **PEER REVIEWED**


CRITICAL TEMPERATURE & PRESSURE:

HEAT OF COMBUSTION:

SPECTRAL PROPERTIES:

OTHER CHEMICAL/PHYSICAL PROPERTIES:
Graphite is one of the softest known materials while diamond is one of the hardest. Graphite exists in two forms: alpha and beta. These have
identical physical properties, except for their crystal structure. Naturally occurring graphites are reported to contain as much as 30% of the rhombohedral (beta) form, whereas synthetic materials contain only the alpha form. The hexagonal alpha type can be converted to beta by mechanical treatment, and the beta form reverts to the alpha on heating it above 1000 deg C.[Lide, D.R. CRC Handbook of Chemistry and Physics 86TH Edition 2005-2006. CRC Press, Taylor &amp; Francis, Boca Raton, FL 2005, p. 4-8] **PEER REVIEWED**


CHEMICAL SAFETY & HANDLING:

SKIN, EYE AND RESPIRATORY IRRITATIONS:
The dust is mildly irritating to lungs.[The Merck Index. 9th ed. Rahway, New Jersey: Merck &amp; Co., Inc., 1976., p. 589] **PEER REVIEWED**

HAZARDOUS REACTIVITIES & INCOMPATIBILITIES:


Very strong oxidizers such as fluorine, chlorine trifluoride and potassium peroxide.[NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)] **PEER REVIEWED**

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH:
PROTECTIVE EQUIPMENT & CLOTHING:


Respirator Recommendations: Up to 25 mg/cu m Assigned Protection Factor (APF) Respirator Recommendation APF = 10 Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. APF = 10 Any supplied-air respirator. [NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)] **PEER REVIEWED**


Respirator Recommendations: Up to 125 mg/cu m Assigned Protection Factor (APF) Respirator Recommendation APF = 50 Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. APF = 50 Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. APF = 50 Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode APF = 50 Any self-contained breathing apparatus with a full facepiece. APF = 50 Any supplied-air respirator with a full facepiece. [NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)] **PEER REVIEWED**

Respirator Recommendations: Up to 1250 mg/cu m Assigned Protection Factor (APF) Respirator Recommendation APF = 2000 Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. [NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)] **PEER REVIEWED**

Respirator Recommendations: Emergency or planned entry into unknown concentrations or IDLH conditions: Assigned Protection Factor (APF) Respirator Recommendation APF = 10,000 Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. APF = 10,000 Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus. [NIOSH. NIOSH Pocket Guide to


PREVENTIVE MEASURES:

SRP: The scientific literature for the use of contact lenses in industry is conflicting. The benefit or detrimental effects of wearing contact lenses depend not only upon the substance, but also on factors including the form of the substance, characteristics and duration of the exposure, the uses of other eye protection equipment, and the hygiene of the lenses. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases, contact lenses should not be worn. In any event, the usual eye protection equipment should be worn even when contact lenses are in place. **PEER REVIEWED**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Wear appropriate gloves to prevent skin exposure. Wear appropriate protective clothing to minimize contact with skin. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.[Fisher Scientific; Material Safety Data Sheet for Graphite Powder. (December 12, 1997) Available from, as of March 17, 2009: http://www.soest.hawaii.edu/krubin/MSDS/graphite.html] **PEER REVIEWED**

SRP: Contaminated protective clothing should be segregated in such a manner so that there is no direct personal contact by personnel who handle, dispose, or clean the clothing. Quality assurance to ascertain the completeness of the cleaning procedures should be implemented before the decontaminated protective clothing is returned for reuse by the workers. Contaminated clothing should not be taken home at end of shift, but should remain at employee's place of work for cleaning. **PEER REVIEWED**

SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a POTW is acceptable only after review by the governing authority. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must meet Hazardous Material Criteria for disposal. **PEER REVIEWED**

DISPOSAL METHODS:

SRP: The most favorable course of action is to use an alternative chemical
product with less inherent propensity for occupational exposure or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material’s impact on air quality; potential migration in soil or water; effects on animal, aquatic, and plant life; and conformance with environmental and public health regulations. **PEER REVIEWED**

**OCCUPATIONAL EXPOSURE STANDARDS:**

**OSHA STANDARDS:**
Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 15 mg/cu m, total dust; 5 mg/cu m, reparable fraction.[29 CFR 1910.1000 (USDOL); U.S. National Archives and Records Administration’s Electronic Code of Federal Regulations. Available from, as of March 3, 2009: http://www.gpoaccess.gov/ecfr] **PEER REVIEWED**


**THRESHOLD LIMIT VALUES:**
8 hr Time Weighted Avg (TWA): 2 mg/cu m, respirable fraction. /Graphite (all forms except graphite fibers)/[American Conference of Governmental Industrial Hygienists TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, OH, 2008, p. 32] **PEER REVIEWED**

**NIOSH RECOMMENDATIONS:**
Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 2.5 mg/cu m, respirable fraction.[NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)] **PEER REVIEWED**

**IMMEDIATELY DANGEROUS TO LIFE OR HEALTH:**

**MANUFACTURING/USE INFORMATION:**
**USES:**
For "lead" pencils, refractory crucibles, stove polish; as pigment, lubricant, graphite cement; for matches and explosives, commutator brushes, anodes, arc-lamp carbons, electroplating; polishing compds, rust and needle-paper; coating for cathode ray tubes; moderator in nuclear piles.[O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 783] **PEER REVIEWED**

In the production of dry cells and storage cells, graphite powder is mixed with the active mass to increase the electrical conductivity. The
conductivity of natural graphite powder is also used in plastics (against static charge buildup), explosives (against ignition by friction), and conductive lacquers. [Ullmann’s Encyclopedia of Industrial Chemistry. 6th ed. Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V6 301 (2003)] **PEER REVIEWED**

Fine-grained graphite powders often having a particle size less than 1 micrometer are suspended in liquid carrier mediums, such as oils, greases, alcohols, or water. Most self-lubricating bearings and packings contain natural graphite as a lubricant ... Other applications that use these properties are the smoothing of the surface of molds to facilitate the removal of castings after cooling, blackwashes, and additives decreasing the friction during the compaction of powders. [Ullmann’s Encyclopedia of Industrial Chemistry. 6th ed. Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V6] **PEER REVIEWED**


MANUFACTURERS:


Toray Carbon Fibers America, Inc., 2030 Highway 20, P.O. Box 248, Decatur,
Zoltek Corporation, 3101 McKelvey Road, St. Louis, MO 63044, (314) 291-5110; Carbon Fibers Manufacturing Facility; Production site: Abilene, TX 79603; Graphite fibers/ [SRI Consulting. 2008 Directory of Chemical Producers United States. Menlo Park, CA 2008, p. 580] **PEER REVIEWED**

METHODS OF MANUFACTURING:


Natural graphite is mined in open-pit and underground mines. The crude ore contains several impurities in various quantities. Only some of the Sri Lanka deposits contain types with carbon contents up to 100%. The crude ore is separated in some places by hand. Crude ores with a carbon content sufficiently high for industrial use are only crushed, dried, graded, and if necessary, milled. Flake graphites must be enriched, preferably by using flotation processes. Since graphite flakes float easily, this process is successfully used even for low-grade ores. [Ullmann's Encyclopedia of Industrial Chemistry. 6th ed. Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V6 300 (2003)] **PEER REVIEWED**

GENERAL MANUFACTURING INFORMATION:

The most important countries mining graphite are the following: flaky graphite grades: Former Soviet Union, China, Malagasy, Sri Lanka, Germany, and Norway; earthy graphite grades: Korea, Mexico, and Austria. [Ullmann’s Encyclopedia of Industrial Chemistry. 6th ed. Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V6: 302 (2003)] **PEER REVIEWED**

The hexagonal alpha type can be converted to the beta by mechanical treatment, and the beta form reverts to the alpha on heating it above 1000 deg C. [Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 4-8] **PEER REVIEWED**

FORMULATIONS/PREPARATIONS:


Naturally occurring graphites are reported to contain as much as 30% of rhombohedral (beta) form, whereas synthetic materials contain only the alpha form. [Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 4-8] **PEER REVIEWED**

U. S. PRODUCTION:

Production volumes for non-confidential chemicals reported under the

LABORATORY METHODS:

ANALYTIC LABORATORY METHODS:
Method: NIOSH 0500, issue 2; Procedure: gravimetric (filter weight)); Analyte: particulates not otherwise regulated, total; Matrix: air; Detection Limit: 0.03 mg per sample. /Particulates not otherwise regulated, total/[CDC; NIOSH Manual of Analytical Methods, 4th ed. Particulates Not Otherwise Regulated, Total. Available from, as of March 4, 2009: http://www.cdc.gov/niosh/docs/2003-154/ ] **PEER REVIEWED**

Method: NIOSH 0600, Issue 3; Procedure: gravimetric (filter weight); Analyte: particulates not otherwise regulated, respirable; Matrix: air; Detection Limit: 0.03 mg per sample. /Particulates not otherwise regulated, respirable/[CDC; NIOSH Manual of Analytical Methods, 4th ed. Particulated Not Otherwise Reguated, Respirable. Available from, as of March 4, 2009: http://www.cdc.gov/niosh/docs/2003-154/ ] **PEER REVIEWED**

SPECIAL REFERENCES:

SYNONYMS AND IDENTIFIERS:

SYNONYMS:


FORMULATIONS/PREPARATIONS:

Exists in two forms: alpha and beta. These have identical properties except of their crystal structure.[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor &amp; Francis, Boca Raton, FL 2007, p. 4-8] **PEER REVIEWED**

Naturally occuring graphites are reported to contain as much as 30% of rhombohedral (beta) form, whereas synthetic materials contain only the alpha form.[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor &amp; Francis, Boca Raton, FL 2007, p. 4-8] **PEER REVIEWED**
ADMINISTRATIVE INFORMATION:

HAZARDOUS SUBSTANCES DATABANK NUMBER: 7713

LAST REVISION DATE: 20090921

LAST REVIEW DATE: Reviewed by SRP on 5/7/2009

UPDATE HISTORY:
Field Update on 2012-04-07, 1 fields added/edited/deleted

Field Update on 2012-04-07, 1 fields added/edited/deleted

Complete Update on 2009-09-21, 30 fields added/edited/deleted

Created 20081223