MATERIAL SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Friction Material, Brake Lining

Product Number: No. 224A
987-6, 1048-9, 1143-155, 1143-301, 1143-320M, 1162-15

Manufacturer:
Federal-Mogul Corporation
26555 Northwestern Highway
Southfield, MI 48033
24hr Emerg # (Infotrac): 1-800-535-5053
International: 001-352-323-3500
Non-Emerg #: 248-354-9844

SECTION 2: COMPOSITION/INFORMATION ON HAZARDOUS INGREDIENTS

Although several of the ingredients used to formulate this product may be hazardous in their raw state, the manufacturing process results in a solid, infusible form, binding or otherwise rendering the mixture inert. We have identified below those hazardous constituents present in quantities greater than 1% (0.1% for carcinogens) that may be released from the product by overheating, burning, machining, or abrading. **The formulations listed in Section 1 may not contain all of the ingredients listed below.**

Ingredient	CAS No.:	% Weight	OSHA PEL	ACGIH TLV (2005)
Acrylic fibers (P.A.N. <9 microns)	24980-62-9	>0.1	None Established	1 fiber/cc *
Aluminum oxide	1344-28-1	>1	15 mg/m^3 (total particulate)	10 mg/m^3
Aramid fiber (<9 microns)	26125-61-1	>1	None Established	1 fiber/cc *
Barium sulfate	7727-43-7	>1	15 mg/m^3 (total particulate)	10 mg/m^3
Brass				
Copper	7440-50-8	>0.6	1 mg/m^3	1 mg/m^3
Zinc	7440-66-0	>0.3	None Established	None Established
Lead (chips only)	7439-92-1	<0.01	0.05 mg/m^3	0.05 mg/m^3, A3
Calcium carbonate	1317-65-3	>1	15 mg/m^3	10 mg/m^3
Calgon (Sodium hexametaphosphate)	68915-31-1	>1	None Established	None Established
Carbon black	1333-86-4	>1	3.5 mg/m^3	3.5 mg/m^3
Cashew resin – cured	69012-00-6	>1	None Established	None Established
Cashew resin – cured	68333-96-0	>1	None Established	None Established
Cashew resin -- cured	67700-42-9	>1	None Established	None Established
Cashew particle	68333-94-8	>1	None Established	None Established
Coke (petroleum)	64743-05-1	>1	None Established	None Established
Graphite (natural)	7782-42-5	>1	15 mppcf	2 mg/m^3 (respirable fraction)
Hydrated lime (Calcium hydroxide)	1305-62-0	>1	15 mg/ m^3 (total particulate)	5 mg/m^3
Iron powder (as iron)	7439-89-6	>1	None Established	None Established
Kyanite	1302-76-7	>1	None Established	None Established
Mineral fibers (fibrous glass, <9 microns)	65997-17-3	>1	None Established	1 fiber/cc *
Nitrile rubber	9003-18-3	>1	None Established	None Established
Phenolic resin-cured	9003-35-4	>1	None Established	None Established
Rottenstone (aluminum silicate)	1335-30-4	>1	None Established	None Established
Rubber (powdered)	9006-04-6	>1	None Established	None Established
Steel fiber	65997-19-5	>1	None Established	None Established
Sulfur	7704-34-9	>1	None Established	None Established
Zinc oxide	1314-13-2	>1	15 mg/m^3 (total particulate)	2 mg/m^3 (respirable fraction)

* As synthetic vitreous fibers per cubic centimeter of sampled air

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Shipped friction materials are not considered hazardous, but operations (overheating, burning, machining, abrading, or riveting) that can create airborne dust should be avoided. Such operations could cause exposures in excess of permissible exposure limits for the respective ingredient and should be considered hazardous.

POTENTIAL HEALTH EFFECTS

Inhalation: Dust may cause irritation. Fume produced at high temperatures may cause metal fume fever, a 24-to 48-hour "flu-like" illness. Repeated inhalation of dust over time may affect a variety of organs (See Chronic Section below).

Skin: May cause irritation. Prolonged skin contact may cause skin sensitization and/or dermatitis.

Eye: Dust may cause irritation and redness. Particles may scratch the eye.

Ingestion: Ingestion may cause irritation, nausea, vomiting, and diarrhea.

Chronic: Repeated inhalation of dust over time may cause fibrotic lung disease and increased risk of sinus and respiratory cancer. Long-term dust inhalation may also harm the nervous, gastrointestinal, renal (kidneys), and hematological (blood) systems.

Carcinogenicity:

COMPONENT	NTP	IARC	OSHA
Rottenstone (Tripoli, as crystalline quartz)	Yes (R)	1	No
Carbon Black, Mineral Fibers (respirable)	No	2B	No
Acrylic Fiber, Aramid Fiber	No	3	No
Lead (impurity in brass chips)	No	2A	Yes
Acrylic Fibers (P.A.N.), Aluminum oxide, Barium sulfate, Brass, Calcium carbonate, Calgon (sodium hexametaphosphate), Cashew Resin-Cured, Coke, Copper, Graphite, Hydrated Lime, Iron Powder, Kyanite, Nitrile rubber, Phenolic Resin-cured, Rubber (powdered), Steel fiber, Sulfur, Zinc, Zinc oxide	No	No	No

(R) NTP has designated this compound as “Reasonably Anticipated To Be A Human Carcinogen” meaning there is limited evidence of carcinogenicity from studies in humans.

Symptoms and Effects of Exposure to Selected Individual Components

ACRYLIC FIBERS (P.A.N. Fibers) (<9 microns in diameter, considered non-respirable)
Inhalation hazard(s) – Overexposure to respirable fibers by inhalation may cause mild and temporary upper respiratory irritation, with discomfort or cough. The toxicological properties of this material have not been fully investigated. The oral and dermal animal testing LD_{50} values were greater than 5.0 g/kg and 2.0 g/kg, respectively.
Other hazard(s) – Skin sensitization has not been observed in human tests. The mechanical action of fibers may cause slight skin irritation at clothing binding points and mild irritation of the eyes and nasal passages.

ALUMINUM OXIDE – Non-fibrous
Inhalation hazard(s) – Exposure to alumina may cause coughing and shortness of breath.
Chronic: Prolonged exposure may affect breathing capacity.
Other hazard(s) – Ingestion is not recommended, but adverse effects have not been reported. Alumina is not absorbed through the skin, but contact may cause abrasion. Dust may irritate eyes.

POTENTIAL HEALTH EFFECTS (continued)
Symptoms and Effects of Exposure to Selected Individual Components

ARAMID FIBERS (<9 microns in diameter, considered non-respirable)
Inhalation hazard(s) – Overexposure to respirable fibers by inhalation may cause mild temporary upper respiratory irritation, with discomfort or cough. Based on animal testing, prolonged and repeated exposure to excessive concentrations of respirable fibers may cause permanent lung injury.
Other hazard(s) – Skin sensitization has not been observed in human tests. The mechanical action of fibers may cause slight skin irritation at clothing points and mild irritation of the eyes and nasal passages.

BARIUM SULFATE
Inhalation hazard(s) – Should be treated as a nuisance dust. Exposure to barium sulfate may cause paroxysmal coughing, wheezing, difficult breathing, and upper respiratory tract irritation.
Other hazard(s) –Adverse effects have not been reported from ingestion. Eye contact may cause temporary discomfort and irritation.

BRASS AND COPPER
Inhalation hazard(s) – Acute: May produce irritation of the nose and/or trachea. May produce acute gastroenteric symptoms resulting in vomiting or inflammation and may cause metal fume fever.
Chronic: Prolonged exposure may cause injury to liver, kidneys or spleen; anemia may develop. Chronic toxicity is reportedly confined to those persons suffering from pre-existing Wilson's disease.
Other hazard(s) – Copper dusts and mists are eye and mucous membrane irritants and skin sensitizers. Acute exposure may cause metallic taste and nasal ulceration and perforation. Prolonged skin contact may produce sensitization dermatitis. Exposure may result in discoloration of the skin and hair. Ingestion of copper compounds may cause vomiting and collapse. Hemolysis, jaundice, anuria, hypertension and convulsions characterize acute poisoning.

Brass chips and brass-type alloys may contain lead.

CALGON (SODIUM HEXAMETAPHOSPHATE)
Inhalation hazard(s) – Exposure to fine dust may cause mild irritation of respiratory tract.
Other hazard(s) – Prolonged exposure may cause mild transient eye or skin irritation. Material is non-hazardous, and is considered a nuisance dust.

CARBON BLACK
Inhalation hazard(s) – Should be treated as a nuisance dust. Exposure may cause temporary upper respiratory tract discomfort. IARC classifies carbon black as Group 2, possibly carcinogenic to humans. Proposition 65 lists carbon black as a cancer-causing chemical.

CALCIUM CARBONATE
A white, finely pulverized powder with no odor.
Inhalation hazard(s) – Limestone dust is considered a nuisance dust. Prolonged exposure may cause irritation to throat and lungs. Silica content is not considered high enough to cause silicosis unless exposures are extremely high and prolonged.
Other hazard(s) – Eyes – may cause mild transient eye irritation.

Symptoms and Effects of Exposure to Selected Individual Components (continued)

CASHEW RESIN – CURED, CASHEW PARTICLE
Inhalation hazard(s) – Cured cashew particles are generally considered to be a nuisance dust, but prolonged exposure may cause irritation of nasal and respiratory tracts leading to sensitization. In the unlikely event of formaldehyde vapors and/or uncured cashew liquid being present, this may cause dermatitis and could lead to a form of nasal cancer.

COKE (PETROLEUM)
Inhalation hazard(s) – Overexposure to dust may result in chronic bronchitis.
Other Hazard(s) – Dust may be abrasive and irritating to eyes.

GRAPHITE
Inhalation hazard(s) **– Acute: Exposure may result in cough, dyspnea, black sputum, and fibrosis. Chronic: Prolonged exposure may cause pneumoconiosis. It is reported that diseases of the respiratory and cardiovascular system may be aggravated by exposure.**

HYDRATED LIME
Inhalation hazard(s) – Dust may cause irritation of nasal and respiratory passages.
Other hazard(s) – Lime is a strong eye irritant, and may cause corrosive damage and blindness. Exposure to dust may cause severe skin irritation, drying and burning, particularly with damaged skin. Swallowing excessive amounts may damage mucous membranes and the digestive system. There are no known chronic hazards.

IRON DUST
Inhalation hazard(s) – Repeated or prolonged exposures to iron dust may cause a form of benign pneumoconiosis called siderosis. Exposure is generally not associated with pulmonary fibrosis or disability unless there is concurrent exposure to other fibrosis-producing materials such as silica.
Other hazard(s) – Contact may cause skin and eye irritation.

KYANITE
Inhalation hazard(s) – May cause coughing, and shortness of breath.
Other hazard(s) – May irritate eyes and abrade the skin.

LEAD
Inhalation hazard(s) – Acute: Exposure may cause muscle and joint pain, and damage to the brain and nervous system.
Ingestion hazard(s) – May affect kidneys.

NITRILE RUBBER
Inhalation hazard(s) - Gases and fumes from thermal processing or decomposition of this product may cause irritation of respiratory tract, skin, and eyes.
Other hazard(s) – Eyes – may cause eye irritation if material is introduced into the eye. Eyes may feel scratchy, become red, and tear.

PHENOLIC RESIN – CURED
Inhalation hazard(s) – Dust may cause irritation of nasal and respiratory tracts. Product is fully cured, so formaldehyde vapor should not be present. If formaldehyde is present, inhalation may cause a form of nasal cancer.
Other hazard(s) – Prolonged exposure can cause irritation, redness, tearing of the eyes, and may lead to sensitization of the skin and dermatitis.

Symptoms and Effects of Exposure to Selected Individual Components (continued)

ROTTENSTONE
Rottenstone is a siliceous rock produced by the weathering of siliceous limestone. It is composed of silica and alumina and contains up to 1% crystalline silica. Effects are expected to be similar to silica (see below).

RUBBER (POWDERED)
Inhalation hazard(s) – May cause mild irritation of the respiratory tract. Repeated and prolonged inhalation of dust may lead to a benign pneumoconiosis. This condition may cause some lung function impairment, but is reversible with reduced exposure.
Other hazard(s) – Eyes – may cause mild transient eye irritation.

SILICA DUST
Inhalation hazard(s) – Acute: Exposure to silica dust may cause paroxysmal coughing, wheezing, dyspnea and upper respiratory tract irritation. Chronic: Prolonged exposure to silica dust may cause silicosis. Crystalline silica has been classified by IARC as, Group 1, carcinogenic to humans. ACGIH classifies crystalline silica as A2, suspected human carcinogen.
Other hazard(s) – Eye or skin contact can cause temporary discomfort and irritation.

STEEL FIBER
Inhalation hazard(s) – Acute: Metal fume fever with symptoms of chills, fever, cough, muscle aches, and difficulty in breathing from manganese; silicon can cause respiratory tract irritation; copper can cause irritation of eyes, nose, throat and lungs with possibility of metal fume fever, chills, nausea, fever, dry throat, cough, and metallic taste. Chronic: Repeated exposure to iron over time may cause lung changes and benign pneumoconiosis; cumulative central nervous system and lung damage may occur with manganese as well as insomnia, and malaise; may cause irritation of the lungs and discoloration of the skin and hair.
Other hazard(s) – May cause mechanical damage to skin and eyes.

SULFUR
Inhalation hazard(s) – Exposure may cause irritation to mucous membranes and upper respiratory tract. Symptoms include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting.
Other hazard(s) – May also irritate by ingestion and skin absorption.

ZINC and ZINC OXIDE
Inhalation hazard(s) – Exposure to zinc oxide can cause a flu-like illness called metal fume fever, with symptoms of metallic taste in the mouth, headaches, cough, shortness of breath, aches and chills, upset stomach and chest pain.
Other hazard(s) – Zinc oxide may be absorbed through the skin to produce the above symptoms. Repeated high exposure may cause ulcer symptoms and affect liver function.

SECTION 4: FIRST AID MEASURES

Ingestion:	Seek medical attention.
Inhalation:	Move to fresh air. Seek medical attention.
Eye Contact:	Flush with water to remove particulate. Seek medical attention.
Skin Contact:	Wash thoroughly with soap and water. If persistent irritation develops, seek medical attention.

SECTION 5: FIRE FIGHTING MEASURES

Flashpoint: N/A **LEL:** N/A **UEL:** N/A **Autoignition Temperature:** This product is inherently flame resistant, but may ignite at temperatures exceeding 1,112°F (600°C) in an oxygen-enriched atmosphere.

Extinguishing Media: Use media suitable for surrounding fire.

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Procedures: Heating to very high temperatures may result in toxic decomposition products (See Section 10).

SECTION 6: ACCIDENTAL RELEASE MEASURES

If a release of dust occurs during machining, abrading, or riveting, remove dust by vacuuming or wet mopping. Vacuums used for this purpose should be equipped with HEPA filters. Do not use compressed air to blow dust in the workplace.

SECTION 7: HANDLING AND STORAGE

Store in a dry place. Shipping and storage may result in accumulation of dust in shipping containers. If this occurs, dispose of the container in an airtight polyethylene bag (see disposal instructions below) or remove dust by vacuuming or wet mopping. Vacuums used for this purpose should be equipped with HEPA filters. Do not use compressed air to blow dust from storage containers.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation Protection: Any operation which may produce dust, including machining, grinding, riveting, or abrading this product, should be adequately exhausted to prevent inhalation of dust.

Respiratory Protection: Use a NIOSH-approved respirator if there is a potential for exposure to dust, vapor, or fume exceeding PELs or TLVs. (See 29 CFR 1910.134, respiratory protection standard).

Skin Protection: If skin irritation occurs, gloves and other protective garments may be worn.

Eyes: Wear safety glasses or goggles, as necessary, if dust exposure is possible.

Other: None known.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES (as lead)

Boiling Point:	N/A	**Vapor Pressure:**	N/A
Melting Point:	N/A	**Vapor Density (air = 1):**	N/A
pH:	N/A	**% Volatile:**	N/A
Specific Gravity:	1.5-2.4 g/cc	**Evaporation Rate:**	N/A
Water Solubility:	Insoluble	**Appearance and Odor:**	Tan or black solid with phenolic odor

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable at normal temperatures and storage conditions.

Incompatibility (Materials/Conditions to Avoid): None.

Hazardous Polymerization: Will not polymerize. This product is fully cured in the manufacturing process.

Decomposition Products: Oxides of carbon, nitrogen and sulfur; hydrocarbons; ammonia; and other trace organic compounds.

SECTION 11: TOXICOLOGICAL INFORMATION

Inhalation: Refer to Section 3

Skin: Refer to Section 3

Eye: Refer to Section 3

Ingestion: Refer to Section 3

SECTION 12: ECOLOGICAL INFORMATION

Soluble copper is known to be an ecotoxin. A study conducted by the Santa Clara Valley Authority identified copper from disc brake pad wear debris as a major contributor to the high level of copper in San Francisco Bay. These findings have been disputed and are currently under review by the Brake Manufacturers Council PEC Committee, Santa Clara Valley Authority, MEMA, and the International Copper Association.

SECTION 13: DISPOSAL CONSIDERATIONS

Federal and state law regulates disposal of solid waste. Waste should be placed in airtight containers. Disposal must be in accordance with 49CFR261, 40CFR262, and applicable state and local regulations.

SECTION 14: TRANSPORTATION INFORMATION	
Proper Shipping Name:	Not regulated
Hazard Class:	N/A
Identification Number:	N/A
Packing Group:	N/A
Shipping Label:	None
Additional Marking Requirement:	None

SECTION 15: REGULATORY INFORMATION

U.S. TSCA: All chemicals used in the manufacture of this product are listed on the U.S. Toxic Substances Control Act (TSCA) Inventory.

California Proposition 65: This product contains carbon black and may contain silica, ingredients known to the State of California to cause cancer, birth defects or other reproductive effects.

SARA Title III – Section 313 Supplier Notification: This product contains the following chemicals subject to SARA Title III/CERCLA "reportable quantities" (RQs) and/or "threshold planning quantities" (TPQs) and/or are classified as "Toxic Chemicals" under the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and 40 CFR 372:

Ingredient:	CAS Number	% Weight
Aluminum oxide (Fibrous only)	1344-28-1	>1
Copper and Compounds	7440-50-8	>1
Zinc and Compounds	1314-13-2, 1314-98-3, 7440-66-6	>1

RCRA Hazardous Waste Code: N/A

CERCLA Hazardous Substances: This product contains chemicals in the raw state classified as CERCLA Hazardous Substances.

OSHA: OSHA has not developed standards other than PELs specific to its constituents.

WHMIS Classification: Not Available

SECTION 16: OTHER INFORMATION

Abbreviations:

CAS #:	Chemical Abstract Services Number
OSHA PEL:	U.S. Occupational Safety and Health Administration Permissible Exposure Limits
ACGIH TLV:	American Conference of Governmental Industrial Hygienists Threshold Limit Value (2005)
fibers/cc:	Fibers per cubic centimeter of sampled air
mg/m^3:	Milligrams of contaminant per cubic meter of sampled air, on a weight-to-volume basis
N/A:	Not Applicable
mppcf:	Millions of particles per cubic foot of sampled air
A3:	ACGIH has classified the compound as a confirmed animal carcinogen with unknown relevance to humans.
NIOSH:	National Institute for Occupational Safety and Health
IARC:	International Agency for Research on Cancer
NTP:	National Toxicology Program
HEPA:	High-efficiency particulate air

This product does not contain any deliberate addition of asbestos.

The information provided on this data sheet was abstracted from a supplier MSDS and standard references in occupational health and toxicology. Federal-Mogul makes no representation or warranty with respect to the information obtained from such references. The information provided is, however, as of the date below, true and accurate to the best of Federal-Mogul's knowledge.