RCT

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Safety Data Sheet

Maleic Anhydride (briquettes)

I IDENTIFICATION

Synonyms ***briquettes of*: 2,5-furandione; dihydro-2,5-dioxofuran; maleic acid anhydride; MAA**
CAS # **108-31-6**
Europe EC # **203-571-6**
Material Use **mfg. of unsaturated polyester & alkyd resins, mfg. of petroleum & lubricant additives & etc.**

EMERGENCY INFORMATION		
In the U.S.A.	*Call CHEMTREC*	*(800) 424-9300*
In Canada	*Call CANUTEC (collect)*	*(613) 996-6666*

II HAZARD IDENTIFICATION

GHS Class	*skin, eye corrosive*	*acute oral*	*acute skin*	*acute inhal.*	*resp. sensitizer*	*skin sensitizer*
(Category)	*(1B)*	*(4)*	*(4)*	*(4)*	*(1)*	*(1)*
Signal Words	*DANGER*	*WARNING*	*WARNING*	*WARNING*	*DANGER*	*WARNING*
Hazard Statements	*causes severe skin burns & eye damage (H314)*	*harmful if swallowed (H302)*	*harmful if in contact with skim (H312)*	*harmful if inhaled (H332)*	*may cause allergy or asthma symptoms if inhaled (H334)*	*may cause an allergic skin reaction (H317)*

GHS Precautionary Statements for Labelling

P260 Do not breathe dust.
P262 Do not get in eyes, on skin or on clothing.
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P272 Contaminated work clothing should not be allowed out of the workplace.
P280 Wear eye protection, protective gloves and clothing of butyl or neoprene.
P312 Call a poison control centre or doctor if you feel unwell.
P313 & P333 If skin irritation or rash occurs, get medical advice/attention.
P362, P364 Take off contaminated clothing and wash it before reuse.
P304, P340 If inhaled remove person to fresh air and keep comfortable for breathing.
P305, P351, P338 Rinse cautiously with water for several minutes. Remove contact lenses if present & easy to do. Continue rinsing.

III COMPOSITION

	CAS NUMBER	%	TLV mg/m³	LD_{50} (*mg/kg*) ORAL	LD_{50} (mg/kg) SKIN	LC_{50} mg/m³ INHALATION
Maleic Anhydride	108-31-6	>98%	0.01 (skin)	>390	>610	>152

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IV FIRST AID

SKIN: Brush off. Then wash with plenty of water. Remove contaminated clothing. Do not reuse until thoroughly laundered. Seek medical help promptly if there is persistent itching or redness in the affected area.

EYES: Wash eyes with plenty of warm water, holding eyelids open. Seek medical assistance if there is any irritation.

INGESTION: Give plenty of water to dilute product. Do not induce vomiting (*NOTE below*). Keep victim quiet. If vomiting occurs, lower victim's head below hips to prevent inhalation of vomited material. Seek medical help promptly.

NOTE: Corrosive substance: first aid must be applied immediately! *Inadvertent inhalation of vomited material may seriously damage the lungs. The stomach should only be emptied under medical supervision, after the installation of an airway to protect the lungs.*

V FLAMMABILITY & FIRE-FIGHTING

Flash Point	102°C / 215°F (closed cup)
Autoignition Temperature	477°C / 890°F
Flammable Limits	1.4% – 7.1%
Combustion Products	carbon monoxide, nitrogen oxides, smoke, acetylene, part oxidised hydrocarbon fragments
Firefighting Precautions	foam, CO_2, water fog or spray; firefighters must wear SCBA
Static Discharge	product dust can accumulate a static charge, static discharge could cause ignition of a dust cloud

VI ACCIDENTAL RELEASE MEASURES

Leak Precaution	not applicable – *solid material*
Handling Spill	sweep, shovel & store in closed containers for disposal ***NOTE:*** *wear an efficient respirator with dust filter when dealing with spill!*

VII HANDLING & STORAGE

To limit risk, store the minimum acceptable amount on premises. Keep in clearly identified outdoor storage, preferably separated from the workplace. Maleic anhydride is deliquescent & reacts with warm water to form maleic acid. This reaction can be vigorous! Keep moisture out of storage containers. Avoid alkalis, sources of ignition & oxidising agents (*see Part X*).

This product should be used in enclosed reaction equipment. No liquid, dust or vapour should be allowed to escape the reaction chamber or the storage vessels.

Avoid creating or breathing product dust when handling. Cut, instead of tearing bags. If dust might form in the workplace, install ventilation to control the airborne concentration to regulated limits (*Part VIII, below*). If dealing with a spill, wear a suitable respirator with an efficient dust filter. Avoid all contact with skin & wash work clothes frequently. An eye bath & safety shower must be available near the workplace.

VIII EXPOSURE CONTROL & PERSONAL PROTECTION

ACGIH TLV	0.01mg/m^3 (*skin & respiratory sensitizer*)	ACGIH STEL	not listed
OSHA PEL	1.0mg/m^3	OSHA STEL	not listed

Ventilation	*always use in closed equipment*; mechanical ventilation may be required to control airborne mist concentration to regulated limits; all workers should have a respirator with dust filter for escape should containment or ventilation fail; if handling occurs at elevated temperature, use a dust filter & an organic vapour cartridge
Hands	wear butyl or neoprene gloves – *other types also protect; confirm suitability with supplier*
Eyes	safety glasses with side shields or chemical goggles – *always protect eyes!*
Clothing	*special protective clothing is not normally required* because ***contact with the product should never occur;*** if contact is possible – eg: when equipment is charged with product – wear appropriate chemically resistant (hands, above) protective garments such as apron, boots, long sleeves, face shield, etc

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IX PHYSICAL AND CHEMICAL PROPERTIES

NOTE: *for Flash Point, Autoignition Temp, & Flammable Limits see Part 5.*

Odour & Appearance	white crystalline solid (briquettes) with irritating, acrid, choking odour; *deliquescent, absorbing moisture from the air forming a wet surface on the briquette*
Odour Threshold	1ppm – 1.3ppm – *odour gives unreliable warning to presence of toxic vapour*
Vapour Density (air = 1)	3.4
Decomposition Temperature	370°C / 698°F
Boiling Point	202°C / 396°F
Melting Point	53°C / 127°F – *sublimes readily at this temperature*
Specific Gravity	1.48 (20/20°C)
Water Solubility	163 grams per litre (30°C / 86°F) – *reacts with water (slowly with cold) to form maleic acid*
- in other solvents	acetone, ethyl acetate, benzene, chloroform; poor solubility in aliphatic hydrocarbons
Log $P_{o/w}$ (*Octanol/H_2O Partition Coefficient*)	not available – *maleic anhydride reacts with water*; Maleic Acid Log$P_{o/w}$ = -0.55
Viscosity	not applicable – *solid material*
pH (*maleic acid solution*)	2.4 (0.01molar solution) – *acid pH due to formation of maleic acid in solution*
Conversion Factor	1ppm – 4.0mg/m^3
Molecular Weight	98 grams/mole

X REACTIVITY

Dangerously Reactive With	strong oxidising agents, light metals (Na, Ca, K, Ba . . .), alkalis, amines, strong reducing agents, ammonia, ammonia solutions and salts; hot water (rapid, heat-producing reaction)
Also Reactive With	cold water, alcohols to form esters; sodium or potassium carbonates; solutions (maleic acid) corrosive to steel (but not stainless 304, 316), some aluminum alloys & zinc

NOTE: *Maleic anhydride is a reactive substance. Check all other substances in the workplace for their compatibility with maleic anhydride.*

Chemical Stability	normally stable; co-polymerises with ethylene, propylene, diethylene
Decomposes in Presence of	moisture: slowly when cold, rapidly (*with heat evolution*) when hot
Decomposition Products	maleic acid
Mechanical Impact	not sensitive

XI TOXICITY INFORMATION

i. ACUTE EXPOSURE

Skin Contact	irritating if contact persists, particularly in the presence of moisture; *maleic anhydride is deliquescent, readily picking up moisture from air to become (corrosive, acidic) maleic acid*; corrosive[1]
Skin Absorption	yes, slowly; toxic effects unlikely by this route
Eye Contact	severely & rapidly irritating (strongly acidic) on contact with moist eye surface, blindness is possible; vapour irritating at 1.0-1.5mg/m^3; corrosive[1]
Inhalation	vapour or dust severely irritating to respiratory system; coughing, shortness of breath & possible pulmonary oedema (*dusting limited by briquette format; also, deliquescence limits dust formation.*) respiratory sensitizer[1]
Ingestion	contact with any part of the digestive system (mouth, throat) likely to produce corrosive burns
LD_{50} (oral)	400, 625, 824-900, 1030[1], 1050 & 1090[1]mg/kg (rat), 465mg/kg (mouse), 875mg/kg (rabbit), 390mg/kg (guinea pig)
LD_{50} (skin)	610mg/kg (rat), >631 & 2620mg/kg (rabbit)[1], >20,000mg/kg (guinea pig) – *severe burns, no mortality*
LC_{50} (inhalation)	152mg/m^3 (rat), 4350mg/m^3 (rat)[1]

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XI TOXICITY INFORMATION, cont'd

ii. CHRONIC EXPOSURE

General	prolonged or repeated ***exposure to vapour*** may cause skin redness and dermatitis; pain & redness of eyes also associated with chronic exposure to vapour; chronic damage to cornea also reported
Sensitising	respiratory sensitisation may follow exposure to vapour; skin sensitisation to dust may also occur
Carcinogen/Tumorigen	not known to be a tumorigen or a carcinogen in humans or animals[1]
Reproductive Effect	no known effect on humans or animals[1]

XII ECOLOGICAL INFORMATION

Bioaccumulation	cannot bioaccumulate due to rapid (0.5 sec) hydrolysis & biodegradation *as maleic acid*
Biodegradation	*as maleic acid*, maleic acid biodegrades rapidly in the presence of oxygen; above 40% in 5 days; one report claims 98% in several hours; also 90% in 25 days, 93% in 21 days, 93% in 11 days & others[1]
Abiotic Degradation	reacts with atmospheric hydroxyl (OH) radicals; ½-life in air from 5-16hr to 5-7 days, also 8 hours[1]
Mobility in soil, water	water soluble; moves readily through soil & the water column
Aquatic Toxicity	***for maleic acid (maleic anhydride rapidly reacts with water to become maleic acid)***
LC_{50} (Fish, 96 hr)	5mg/litre (Pimephelas promelas); 75mg/litre (Oncorhynchus mykiss & Lepomis macrochirus)[1]
LC_{50} (Crustacea, 48hr)	43[1], 83 & 160mg/l (Daphnia magna); 5600mg/litre (Daphnia magna – *pH=7*)
EC_{10} (Algæ)	125mg/litre (Hematococcus pluvialis), 74 & 150mg/litre (Pseudokirchnerella subcapitata)[1]
EC_{10} (Bacteria)	11,800 & 14,600mg/litre (Pseudomonas putida)[1]

NOTE: *Maleic anhydride reacts with water to form maleic acid which biodegrades rapidly. Much of the aquatic toxicity ascribed to maleic anhydride may be caused by the low pH due to maleic acid formation.*

XIII DISPOSAL CONSIDERATIONS

Waste Disposal **do not flush to sewer**; may be incinerated in approved facility – rotary kiln (cement facility) above 800°C, or fluidised bed furnace above 450°C ; *should be handled by a licensed hazardous waste disposal specialist*

Containers **Drums** should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use.
Pails must be vented and thoroughly dried prior to crushing and recycling.
IBCs (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5 years). Steel containers must be inspected, pressure tested & recertified every 5 years.
Warning: never cut, drill, weld or grind on or near this container, even if empty.

XIV TRANSPORT INFORMATION

USA 49 CFR & Canada TDG

Product Identification Number	**UN – 2215**
Shipping Name	**maleic anhydride**
Classification	**Class 8; Packing Group III**
Marine Pollution	***not a marine pollutant***
Reportable Quantity (RQ)	***5000lbs (2270kg)***

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PLEASE ENSURE THAT THIS MSDS IS GIVEN TO, AND EXPLAINED TO PEOPLE USING THIS PRODUCT.

EMERGENCY INFORMATION: Call CHEMTREC (800) 424-9300

XV REGULATIONS

Canada DSL	**on inventory**
U.S.A. TSCA	**ACTIVE**
Europe EINECS	**on inventory & REACH registered**
Japan ENCS	**on inventory #1053 –** *low molecular weight chain-like organic compounds*
Australia AICS	**on inventory from June 1996**
Korea ECL	**on inventory from January 1997**
Philippines PICCS	**on inventory**
New Zealand NZloC	**on inventory –** *approval #HSR 003012, June 2006*
Asia-PAC	**on inventory**

U.S.A. Regulations:

Immediately Dangerous to Life or Health: 10 mg/cu m

Allowable Tolerances: Maleic anhydride is exempted from the requirement of a tolerance when used as a for pesticide formulations applied to apples with a minimum pre-harvest interval of 21 days, in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

OSHA Standards: Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 0.25 ppm (1 mg/cu m).

NIOSH Recommendations: Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 1 mg/cu m (0.25 ppm).

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 0.1 ppm, sensitizer. Excursion Limit Recommendation: Excursions in worker exposure levels may exceed 3 times the TLV-TWA for no more than a total of 30 minutes during a work day, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded. A4; Not classifiable as a human carcinogen.

Atmospheric Standards: This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Maleic anhydride is produced, as an intermediate or a final product, by process units covered under this subpart. Listed as a hazardous air pollutant (HAP) generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Maleic anhydride is included on this list.

Clean Water Act Requirements: Maleic anhydride is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

CERCLA Reportable Quantities: Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 5000 lb or 2270 kg. The toll free number of the NRC is (800) 424-8802. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b).

TSCA Requirements: Pursuant to section 8(d) of TSCA, EPA promulgated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies. Maleic anhydride is included on this list.

RCRA Requirements: As stipulated in 40 CFR 261.33, when maleic anhydride, as a commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate, becomes a waste, it must be managed according to Federal and/or State hazardous waste regulations. Also defined as a hazardous waste is any residue, contaminated soil, water, or other debris resulting from the cleanup of a spill, into water or on dry land, of this waste. Generators of small quantities of this waste may qualify for partial exclusion from hazardous waste regulations (40 CFR 261.5).

SARA

Physical Hazards	Chemical Hazards
☐Explosive	☒Acute toxicity (any route of exposure)
☐Flammable	☒Skin corrosion or irritation
☐Oxidizer (liquid, solid or gas)	☒Serious eye damage or eye irritation
☐Self-reactive	☒Respiratory or skin sensitization
☐Pyrophoric (liquid or solid)	☐Germ cell mutagenicity
☐Pyrophoric Gas	☐Carcinogenicity
☐Self-heating	☐Reproductive toxicity
☐Organic peroxide	☒Specific target organ toxicity (single or repeated ex.)
☐Corrosive to metal	☐Aspiration hazard
☐Gas under pressure (compressed gas)	☐Simple Asphyxiant
☐In contact with water emits flammable gas	☐Hazard Not Otherwise Classified
☐Combustible Dust	
☐Hazard Not Otherwise Not Otherwise Classified	

XVI OTHER INFORMATION

Date of Preparation **June 2011**
Date of Revision **May 2013, March 2016, February 2019, February 2022**
Prepared for Rierden Chemical & Trading Company, by **Peter Bursztyn**
With data from Registry of Toxic Effects of Chemical Substances (RTECS - USA), Hazardous Substance Data Base (HSDB - USA), Cheminfo (CCOHS - Canada), OSHA website, European Chemicals Agency (EChA) dossiers & other sources (below if used), as required/available.

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