



MATERIAL SAFETY DATA SHEET

Batteries, Wet, Filled with Acid

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I. PRODUCT IDENTIFICATION

Product Name LEAD ACID BATTERY, WET
Other Name Battery, Wet, filled with Acid.
Manufacturer's Product Code Battery, Automotive
UN Number 2794
Dangerous Goods Class 8
Packing Group not assigned
Hazchem Code 2W
Poisons Schedule Number S6
Use Starting, lighting, ignition for cars, trucks, etc

COMPANY DETAILS

SHIELD BATTERIES LTD
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Emergency Number +44 1279 652067

PHYSICAL DATA

Appearance The battery is a manufactured article. Sulphuric Acid Electrolyte is a clear mobile liquid.
Boiling Point / Melting Point Sulphuric Acid Electrolyte 95C / -7 to -70C
Vapour Pressure Sulphuric Acid Electrolyte 13 to 22mm Hg @ 25°C
Specific Gravity Sulphuric Acid Electrolyte 1.2 to 1.3 @ 25°C
Flashpoint Sulphuric Acid Electrolyte Not Applicable
Flammability Limits Sulphuric Acid Electrolyte Not Applicable
Solubility in Water Sulphuric Acid Electrolyte 100%

Other Properties

Sulphuric Acid Contact with combustibles and organic materials may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulphur trioxide gas, strong oxidisers and water. Contact with metals may produce toxic sulphur dioxide fumes and may release flammable hydrogen gas.
Lead Compounds Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen and reducing agents

Ingredients

Chemical Name	CAS Number	Proportion by Weight
Lead / Lead Dioxide	7439-92-1	55 - 70%
Sulphuric Acid	7664-93-9	20 - 35%
Antimony	7440-36-0	1 - 1.7%
Arsenic	7440-38-2	<0.5%

II. HAZARD IDENTIFICATION

HEALTH



ENVIRONMENTAL



PHYSICAL



HEALTH EFFECTS

Acute

Swallowed	Sulphuric Acid Lead Compounds	Corrosive and causes severe burns. May cause severe irritation of mouth, oesophagus and stomach. Acute indigestion may cause abdominal pain, nausea, vomiting, diarrhoea and severe cramping.
Eye	Sulphuric Acid Lead Compounds	Severe irritation, burns, cornea damage, blindness. May cause eye irritation
Skin	Sulphuric Acid Lead Compounds	Sever irritation, burns and ulceration Not readily absorbed through the skin
Inhaled	Sulphuric Acid Lead Compounds	Breathing of vapours or mists may cause respiratory irritation Inhalation of lead dust or fumes may cause irritation of upper respiratory tract and lungs

Chronic

Sulphuric Acid Lead Compounds	Possible erosion of tooth enamel, inflammation of nose, throat and bronchial tubes. May cause constipation, weight loss anaemia, fatigue, kidney damage, pain in joints, neuropathy (particularly of the motor nerves) and reproductive changes in male and female.
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Physical

May form explosive air / gas mixture during charging
Extremely flammable gas (Hydrogen)
Explosive, fire, blast or projection hazard

Precautionary Statements

Wash thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves / protective clothing, eye protection / face protection
Avoid breathing dust / fumes / gas / mist / vapours / spray
Use only outdoors or in a well ventilated area

III. FIRST AID MEASURES

First Aid

Swallowed	Sulphuric Acid	Do not induce vomiting. Give a glass of water. Seek immediate medical assistance
Eye Contact	Sulphuric Acid	Irrigate with water for 15 minutes. Seek immediate medical assistance
Skin Contact		

Inhaled	Sulphuric Acid	Remove contaminated clothing and wash skin thoroughly with water. Seek medical assistance if symptoms persist
	Lead Compounds	Apply artificial resuscitation and seek medical assistance if not breathing
First Aid Facilities		Gargle, wash nose and lips, seek immediate medical assistance
		Access to a sufficient supply of potable water may be necessary
Advice to Doctor		Treat Symptomatically

IV. FIRE FIGHTING MEASURES

Flash Point	N/A
Extinguishing Media	CO2, foam, dry chemical. Do not use CO2 directly onto cells. Avoid breathing vapours. Use appropriate media for surrounding fire
Special Fire Fighting Procedures	If batteries are on charge, shut off power. Use positive pressure, self contained breathing apparatus. Water applied to electrolyte generates heat and causes it to spatter. Wear acid resistant clothing, gloves, face and eye protection. <i>Note that strings of series connected batteries may still pose risk of electric shock even when charging equipment is shut down.</i>
Unusual Fire and Explosion Hazard	Highly flammable hydrogen gas is generated during charging and operation of batteries. To avoid risk of fire or explosion, keep sparks or other sources of ignition away from batteries. Do not allow metallic materials to simultaneously contact negative and positive terminals of cells and batteries. Follow manufacturers instructions for installation and service.

V. ACCIDENTAL RELEASE MEASURES - ENVIRONMENTAL PRECAUTIONS

Should electrolyte leak from a battery for any reason, it should be absorbed onto dry sand, earth or other inert material and must not be allowed to enter any drains. If possible, neutralise any leaked electrolyte using soda ash, bicarbonate of soda, sodium carbonate, or calcium powder and then wash thoroughly with water. Collect absorbed material and place in a sealed container for disposal - See Disposal Information.

VI. PRECAUTIONS FOR USE

Exposure Standard		Workplace Exposure Standard for Metallic Lead is 0.15mg/m ³ in air Workplace Exposure Standard for Sulphuric Acid is 1mg/m ³ in air
Engineering Controls		Use only in a well ventilated area
Work Practices		Batteries are heavy - appropriate material handling equipment and techniques should be used. Handle batteries cautiously to avoid spills. Ensure vent caps are on securely. Avoid contact with internal components. Wear protective clothing when filling batteries as detailed below in "Personal Protection". Follow manufacturers instructions for installation and service
PPE	Respirator Type	Not applicable under normal use
	Glove Type	When handling sulphuric acid, wear impervious PVC acid resistant gloves with elbow length gauntlet
	Eye Protection	When handling sulphuric acid, wear chemical goggles / face shield
	Clothing	When handling batteries, wear safety boots
Flammability		Under some operating conditions / charging or sulphuric acid contact with most common metals, flammable hydrogen gas can be liberated. It is recommended that 2% hydrogen concentration is not exceeded. Do not use

close to ignition sources. Use in a well ventilated area.

VII. HANDLING AND STORAGE

Handling

Unless involved in recycling operations, do not breach the casing or empty the contents of the battery. Handle carefully and avoid tipping, which may allow electrolyte leakage. There may be increased risk of electric shock from strings of connected batteries.

Keep containers tightly closed when not in use. If battery case is broken, avoid contact with internal components. Keep vent caps on and cover terminals to prevent short circuits. Place cardboard (or similar) between layers of stacked batteries to avoid damage and short circuits. Keep away from combustible materials, organic chemicals, reducing substances, metals, strong oxidisers and water. Use banding or stretch wrap to secure items for shipping.

Storage

Always cover battery terminals with coloured "terminal protectors" to avoid accidental shorting and melting of terminals and potential explosion of battery.

Store batteries in a cool dry well ventilated area with impervious surfaces and adequate containment in the event of spills. Batteries should also be stored under cover for protection against adverse weather conditions. Avoid damage to containers, keep away from fire, sparks and heat.

Charging

Keep away from metallic objects that could bridge the terminals on a battery and create a dangerous short circuit. There is a possible risk of electric shock from charging equipment and strings of connected batteries, whether or not being charged. Shut off power to chargers when not in use and before detachment of any circuit connections. Batteries being charged will generate and release flammable hydrogen gas. Charging space should be ventilated. Keep battery vents in position. Prohibit smoking and avoid creation of flames and sparks nearby.

Disposal

Wear face and eye protection when near batteries being charged. Refer to the local waste disposal authority for disposal of lead compounds, sulphuric acid and spent soda / sodium bicarbonate. Spent batteries should be sent to a secondary lead smelter for recycling.

VIII. EXPOSURE CONTROL / PERSONAL PROTECTION

Engineering Controls

Store and handle in a well ventilated area. If mechanical ventilation is used, components must be acid resistant. Handle batteries cautiously to avoid spills. Make certain vent caps are on securely. Avoid contact with internal components.

Wear protective clothing, eye and face protection when filling, charging or handling batteries. Do not allow metallic materials to simultaneously contact the negative and positive terminals of the batteries. Charge to batteries in areas with adequate ventilation. General dilution ventilation is acceptable.

Respiratory Protection

Not required under normal conditions.

Skin Protection

If battery case is damaged, use rubber or plastic acid-resistant gloves with elbow length gauntlet, acid resistant apron, clothing and boots.

Eye Protection

If battery case is damaged, use chemical goggles or face shield.

Other Protection

In areas where sulphuric acid is handled in concentrations greater than 1%, emergency eyewash stations and showers should be provided with unlimited water supply.
 Acid resistant aprons
 Under severe exposure emergency conditions, wear acid resistant clothing and boots
 Face shield recommended when adding water or electrolyte to batteries. Wash hands after handling

IX. PHYSICAL AND CHEMICAL PROPERTIES

Electrolyte				
Boiling Point		95°C - 115°C	Specific Gravity (H2O = 1)	1.215 - 1.350
Melting Point		N/A	Vapour Pressure (mm Hg)	10
Solubility in Water		100%	Vapour Density (Air = 1)	Greater than 1
Evaporation Rate	(Butyl Acetate = 1)	Less than 1	% Volatile by Weight	N/A
pH		1 to 2	Flash Point	(Hydrogen gas) Below room temp
Lower Explosive Limit		4.1% (hydrogen)	Upper Explosive Limit	74.2% (Hydrogen)
Appearance & Odour		Manufactured article, no apparent odour. Electrolyte is a clear liquid with a sharp penetrating pungent odour		

X. STABILITY AND REACTIVITY

This product is stable under normal conditions at ambient temperatures

Conditions to avoid		Prolonged overcharge, sources of ignition
Incompatibility	Sulphuric Acid	Contact with combustibles and organic materials may cause fire and explosion. Reacts strongly with reducing agents, metals, sulphur trioxide and water
	Lead Compounds	Contact with metals may produce toxic sulphur dioxide fumes and may release flammable hydrogen gas Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen and reducing agents
	Arsenic Compounds	Strong oxidisers, bromine azide. NOTE: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas Arsine
Hazardous Decomposition Products		
	Sulphuric Acid	Sulphur trioxide, carbon monoxide, sulphur acid mist, sulphur dioxide and hydrogen sulphide
	Lead Compounds	High temperatures likely to produce toxic metal fume, vapour or dust. Contact with a strong acid or base or presence of nascent hydrogen may generate highly toxic Arsine gas.
Hazardous Polymerisation		Will not occur

XI. TOXICOLOGICAL INFORMATION

Routes of Entry	Sulphuric Acid	Harmful by all routes of entry
	Lead Compounds	Hazardous exposure can occur only when product is heated, oxidised or otherwise processed or damaged to create dust, vapour or fume. The presence of hydrogen may create highly toxic Arsine gas
Inhalation	Sulphuric Acid	Breathing of sulphuric acid vapours or mists may cause severe respiratory irritation
	Lead Compounds	Inhalation of lead dust or fumes may cause irritation of upper respiratory tract and lungs
Ingestion	Sulphuric Acid	May cause severe irritation of mouth, throat, oesophagus, and stomach
	Lead Compounds	Acute ingestion may cause abdominal pain, nausea, vomiting, diarrhoea and severe cramping. This may lead to systemic toxicity and must be treated by a physician
Skin Contact	Sulphuric Acid	Severe irritation, burns and ulceration
	Lead Compounds	Not absorbed through the skin
Eye Contact	Arsenic Compounds	Contact may cause dermatitis and skin hyper pigmentation
	Sulphuric Acid	Severe irritation, burns, cornea damage and blindness
	Lead Compounds	May cause eye irritation
Effects of Overexposure - Acute		
	Sulphuric Acid	Severe skin irritation, damage to cornea, upper respiratory irritation
	Lead Compounds	Symptoms of toxicity include headache, fatigue, abdominal pain, loss of appetite, muscular aches, weakness, sleep disturbance and irritability
Effects of Overexposure - Chronic		
	Sulphuric Acid	Possible erosion of tooth enamel, inflammation of nose, throat and bronchial tubes
	Lead Compounds	Anaemia, neuropathy, particularly of the motor nerves, with wrist drop, kidney damage, reproductive changes in males and females. Repeated exposure to lead and lead compounds in the workplace may result in nervous system toxicity. Heavy lead exposure may lead to central nervous system damage, encephalopathy and damage to the hematopoietic tissues.
Oral LD50	Sulphuric Acid	2140mg/kg Rat
	Lead Compounds	No specific data

XII. ECOLOGICAL INFORMATION

Environmental Fate		Lead is very persistent in soil and sediment. No data on environmental degradation Mobility of metallic lead between ecological compartments is slow. Bioaccumulation of lead occurs in aquatic and terrestrial animals and plants, but little bioaccumulation occurs in the food chain
Aquatic Toxicity	Sulphuric Acid	Most studies include lead compounds and not elemental lead.
		24 hr LC50, freshwater fish (Brachydanio rerio) 82mg/L
	Lead	96 hr LOEC, freshwater fish (Cyprinus carpio) 22mg/L
Additional Information	Arsenic	48hr LC50, modelled for aquatic invertebrates) <1mg/L (based on Lead bullion)
		24hr LC50, freshwater fish (Carrassius auratus) >5000g/L
		No known effects on stratospheric ozone depletion
	Volatile organic compounds	0% (by volume)
	Water Endangering Class (WGK)	N/A

XIII. DISPOSAL INFORMATION

Undamaged and damaged Batteries

Store in an impervious container and send to smelter for recycling. Must be treated as special waste
Contact supplier for assistance

Absorbed Spilled Electrolyte

Place in a sealed inert container. Treat as special waste. Contact supplier for assistance.

XIV. TRANSPORT INFORMATION

IATA Dangerous Goods Regulations

Air Transport (IATA-DGR) - Classification: Class 8 - UN N°: UN2794 - Proper Shipping Name: BATTERIES, WET, FILLED WITH ACID - Packing Group: NOT ASSIGNED - Label required: Corrosive

IMDG International Maritime Dangerous Goods

Sea Transport (IMDG Code) - Classification: Class 8 - UN N°: UN2794 - Proper Shipping Name: BATTERIES, WET, FILLED WITH ACID - Packing Group: NOT ASSIGNED - EmS: F-A, S-B - Label required: Corrosive, Special Provision 295

ADR European Agreement concerning the International Carriage of Dangerous Goods by Road

Land Transport (ADR/RID) - UN N°: UN2794 - Classification ADR/RID: Class 8 - Proper Shipping Name: BATTERIES, WET, FILLED WITH ACID - Packing Group ADR: NOT ASSIGNED - Label required: Corrosive - ADR/RID: New and spent batteries are excepted from all ADR/RID if they meet the requirements of Special Provision 598.

XV. REGULATORY INFORMATION

Batteries supplied by Shield Batteries are subject to The Batteries and Accumulators (containing Dangerous Substances) Regulations 1994 and are marked in accordance with the requirements of Regulation 4.

XVI. OTHER INFORMATION

Never install batteries in a gas tight enclosure as gasses may be generated during use

Batteries must always be charged on a voltage regulated charging system and adequate ventilation provided to avoid the build up of ignitable gases. Contact your battery supplier for advice

Never short circuit battery terminals as sparks and arcs can injure personnel and are a fire hazard

Do not charge batteries above 50°C or discharge or store above 60°C

Under extreme conditions of charging, equipment malfunctions and or battery failure, high voltage and high temperature conditions may occur causing the evolution of Hydrogen Sulphide (H₂S) gas, which is toxic. If detected by its odour of rotten eggs (at low concentration), switch off the charging equipment and evacuate all personnel from the area and ventilate well. Seek advice before attempting to re-start charging

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