LEAD INDUSTRIES ASSOCIATION

60 EAST 42ND STREET
NEW YORK 17, N. Y.

Pigments and Chemicals Division

September 7, 1956

SUBJECT: CHEMICAL SAFETY DATA
Sheet SD-64 - Lead Oxides

To Members of the Red Lead Technical Committee:

Attached is a copy of Chemical Safety Data Sheet SD-64 on Lead Oxides, issued by the Manufacturing Chemists' Association, Inc. You will recall that this Data Sheet was prepared with the assistance of the Red Lead Technical Committee of the Lead Industries Association.

We have a very limited supply of additional copies which we can provide as long as they last; otherwise copies may be obtained directly from the Manufacturing Chemists' Association, Inc., 1625 Eye Street, N.W., Washington 6, D. C., at 30¢ per copy, with a 10 per cent discount for quantities of 100 or more.

Very truly yours,

Secretary.

Chemical Safety Data Sheet SD-64

PROPERTIES AND ESSENTIAL INFORMATION

FOR

SAFE HANDLING AND USE

OF

LEAD OXIDES

ADOPTED 1956

Chemicals in any form can be safely stored, handled or used if the physical, chemical and hazardous properties are fully understood and the necessary precautions, including the use of proper safeguards and personal protective equipment, are observed.

Manufacturing Chemists' Association, Inc.

1625 Eye Street, N. W., Washington 6, D. C.

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Chemical Safety Data Sheet

LEAD OXIDES

PREFACE

The inhalation or ingestion of sufficient quantities of lead oxide will result in lead poisoning.

The Interstate Commerce Commission does not classify lead oxide as a dangerous article requiring special packaging, but the Manufacturing Chemists' Association recommends the use of a warning label on containers.

Details for the safe handling of lead oxide and of medical management are given in the body of the data sheet.

Revised
Sept
10-46

Chemical Safety Data Sheet SD-64

LEAD OXIDES

ADOPTED AUGUST, 1956

1. NAMES

Chemical Name:	Lead Oxide	Chemical Name:	Lead Monoxide
Common Name:	Red Lead	Common Name:	Litharge
Formula:	Pb_3O_4	Formula:	PbO

2. PROPERTIES

2.1 GRADES AND STRENGTHS

2.1.1 Grades

Red Lead — The common grades of commercial red lead are the 85, 95, 97 and 98% grades. These percentages signify the Pb_3O_4 or "true red lead" content. The remainder consist almost entirely of litharge (PbO).

Litharge — Low metal content oxides contain 96 to 99.5% PbO. High metal or battery grade litharges contain 50 to 95% PbO.

2.1.2 Sieve Sizes

Red Lead — Furnace types—96% minimum through 325 mesh. Fume types—99% minimum through 325 mesh.

Litharge — Furnace types—96 to 99% through 325 mesh. Fume types—99% minimum through 325 mesh.

2.2 PROPERTIES AND CHARACTERISTICS

	Red Lead	*Litharge*
Solubility	Insoluble in weak acids.	Soluble in weak acids.
Color	Orange to brick red.	Low metal content oxides—yellow to green to brown. High metal content oxides—gray to brown.
Melting Point	Decomposes to litharge and oxygen at 500°C. (932°F.)	888°C. (1630°F.)
Specific Gravity	8.8 to 9.2	9.2 to 9.7

Threshold Limit (based on contained lead)—0.15 mg. per cu. m. of air.

3. HAZARDS

3.1 HEALTH HAZARDS (See 10.)

Prolonged inhalation of sufficient quantities of lead oxide will result in an accumulation of lead within the body. First signs are of lead absorption with gradual or rapidly increasing evidence of illness finally developing into a picture of acute lead poisoning.

3.2 FIRE AND EXPLOSION HAZARDS

Red lead and litharge are noncombustible but red lead when mixed with combustible matter may assist combustion by furnishing oxygen.

4. ENGINEERING CONTROL OF HAZARDS

4.1 BUILDING AND EQUIPMENT DESIGN

4.1.1 Basic engineering design should consider proper ventilation of work areas. Provision should be made for dust hoods and equipment should be exhaust ventilated.

4.1.2 Work areas, locker rooms, wash rooms and especially lunch rooms should be designed and operated so as to be free from contamination by lead oxide dust or fume.

4.1.3 Drinking water, free of contamination, must be in adequate supply and so located to encourage employees to drink freely.

4.2 AIR ANALYSIS AND VENTILATION

Ventilation must be adequate to maintain the atmospheric concentration of lead in all working areas at a level that does not exceed the generally accepted threshold limit. Frequent air analyses are essential in order to determine the continued efficiency of the ventilating system. General ventilation is seldom sufficient, but must be supplemented by use of enclosed systems and local exhaust ventilation.

5. EMPLOYEE SAFETY

5.1 EMPLOYEE EDUCATION AND TRAINING (See 10.2.1)

Employees should be taught to perform their respective duties involving the handling of lead oxide in such a manner as to avoid dust and spillage, and to observe strict rules of cleanliness. They should be instructed to watch the ventilating system and immediately report any breakdowns or evidence of decreased efficiency. In the event of an accident creating a high concentration of dust in the workroom, proper respirators should be available for immediate use.

5.2 PERSONAL PROTECTIVE EQUIPMENT

5.2.1 Availability and Use

While personal protective equipment is not an adequate substitute for good safe working conditions, adequate ventilation, and intelligent conduct on the part of employees working with lead oxides, it is, in many instances, the only practical means of protecting the worker, particularly in situations of emergency. One should keep firmly in mind that personal protective equipment protects only the worker wearing it, and other unprotected workers in the area may be exposed to danger.

The correct usage of personal protective equipment requires the education of the worker in proper employment of the equipment available to him. Under conditions which are sufficiently hazardous to require personal protective equipment, its use should be supervised and the type of protective equipment selected should be capable of control over any potential hazard.

5.2.2 Respiratory Protection

Respiratory protective equipment must be carefully maintained, inspected, cleaned and sterilized at regular intervals, and always before use by another person. Personnel wearing such equipment must be carefully instructed as to its use and limitations.

5.2.2.1 *Dust Respirators*, equipped with suitable filters, approved by the United States

Bureau of Mines for the purpose, will afford protection against lead oxide dust.

5.2.2.2 *Metal Fume Respirators*, approved by the U. S. Bureau of Mines for the purpose, will afford protection against lead oxide fumes.

5.2.3 Head Protection

Where there is no danger from falling objects, and safety or "hard" hats are considered unnecessary, soft-brimmed hats or caps may be worn.

5.2.4 Foot Protection

Leather or rubber safety shoes with built-in steel toe caps are recommended for workers handling drums and cans of lead oxide. Rubbers may be worn over leather safety shoes. Rubbers and shoes should be thoroughly cleaned and ventilated after contamination.

6. FIRE FIGHTING

When fighting fires involving lead oxides firemen should be equipped with suitable metal fume respirators to give protection against lead oxide fumes (See 5.2.2.2).

7. HANDLING AND STORAGE

Lead oxides are not subject to the Interstate Commerce Commission Regulations for the purpose of transportation.

7.1 USUAL SHIPPING CONTAINERS

Metal Drums:

Single trip, 20 or 22 gallon, 20 or 22 gauge, ring seal with gasket.

Returnable, 22 gallon, 16 gauge, ring seal with gasket.

Returnable, 30 gallon, 12 gauge, ring seal with gasket.

Returnable, 20 or 22 gallon, 14 gauge.

The 22 gallon drums contain about 600 lbs. lead oxide.

Multi-wall Paper Bags:

5 ply, 50 lbs.

Metal Cans:

25 lbs., 50 lbs., 100 lbs.

7.2 LABELING AND IDENTIFICATION

7.2.1 Each container should carry an identifying label or stencil.

7.2.2 The Manufacturing Chemists' Association recommends that all containers of lead oxides should bear the following label in addition to, or in combination with any label, warning or other statement required by statutes, regulations or ordinances:

LEAD OXIDE (Red Lead)

WARNING! HARMFUL DUST

Avoid breathing dust.

Wash thoroughly before eating or smoking.

Keep away from food or food products.

MCA Chemical Safety Data Sheet available.

LEAD MONOXIDE (Litharge)—AS FOR RED LEAD

7.3 HANDLING, RETURN AND DISPOSAL

7.3.1 Finely divided dust is the main hazard. Every precaution should be taken to prevent inhalation of dust particles.

7.3.2 Drums, bags and cans should be unloaded in a manner to prevent the escape of dust into the air. This often requires handling in an enclosed space provided with suitable local exhaust ventilation.

7.3.3 It is recommended that containers of lead oxide be handled carefully under dust hoods.

7.3.4 Users should replace container lids securely with adequate gaskets to ensure sanitary return.

7.3.5 After emptying, paper bags should be handled carefully to avoid any scattering of dust. They should be destroyed by fire with adequate provision for fumes. Metal drums, especially those which may be re-used, must be thoroughly cleaned before disposal.

7.4 STORAGE

Lead oxide containers should be stored in a dry place to prevent contact with water and forestall a fire hazard due to exothermal reactions. After opening, lead oxide containers should be kept closed when not in use.

7.5 REPACKAGING

7.5.1 Lead oxides may be repackaged in used containers or types indicated in 7.1.

7.5.2 Packages should be labeled in accordance with any state or local laws or regulations which apply.

7.5.3 In transferring lead oxides from one container to another, care should be taken to avoid scattering dust. Use of suitable enclosures provided with local exhaust ventilation is recommended.

7.6 SPILLS AND LEAKAGES

7.6.1 In the event of an accident creating a high concentration of dust in the workroom, or if spillage occurs in an unventilated room, proper respirators should be available for immediate use. Spillage should be cleaned up promptly, if possible by vacuum cleaning or by use of moist sweeping compound (See 5.1).

8. TANK AND EQUIPMENT CLEANING AND REPAIRS

Not applicable to lead oxides.

9. WASTE DISPOSAL

9.1 Lead oxide is completely salvageable and consequently the question of disposal does not usually arise. Paper bags in which it has been shipped may be burned provided there is adequate draft to control fumes. Care should be taken to prevent the scattering of ashes which may have a lead content.

9.2 All pertinent local or state laws or regulations regarding the disposal of waste must be observed.

10. MEDICAL MANAGEMENT

10.1 HEALTH HAZARDS

10.1.1 Prolonged inhalation or ingestion of sufficient quantities of lead oxide will result in an accumulation of lead within the body. Symptoms may appear gradually or they can progress rapidly to acute intoxication. There is no evidence of significant absorption through the skin.

10.1.2 Toxicity

Chronic lead poisoning which may lead to an acute episode is a serious occupational hazard.

10.1.2.1 *Systemic Effects*

The subjective symptoms are usually confined to the alimentary tract or neuromotor system and may include a metallic taste in the mouth, loss of appetite, indigestion, nausea, vomiting, constipation, abdominal cramps, disturbance of rest and sleep, and weakness. Wrist drop or, rarely, foot drop may develop. Other muscular groups subject to constant use may be affected. Physical signs, such as lead line on

the gum margin, tremor and loss of weight may or may not be present.

The most reliable evidence of lead absorption sufficient to cause lead poisoning comes from the results of laboratory tests.*

The most dependable method of determining accurately the extent of lead absorption is by the quantitative analysis of the lead content of the blood and urine by means of methods of high specificity and precision. The results of these tests give an accurate means of knowing how much lead has been absorbed, and further, by the analysis of suitable samples of urine, it is possible to estimate accurately the rate of lead excretion. In general, quantitative determination of the lead content of the feces of men while working, or within the first 24 or 48 hours after the end of the last day of work, gives an indication of the amount of lead inhaled or ingested, but the results of such analyses, under other circumstances, are too difficult to interpret to be of use for other than experimental purposes, and therefore such determinations are of negligible diagnostic value.

Lead poisoning occurs rarely, if at all, and only in its mildest manifestations, in occupations in which regularly-employed workmen excrete lead in the urine in an average concentration of 0.10 mg. or less per liter, and in which the exposure is controlled with such uniformity that individual analytical results on the urine are generally below 0.15 mg. per liter and rarely in excess of 0.20 mg. per liter.

The normal average lead content of human blood is approximately 0.03 mg. per 100 ml. The upper limit of the normal range of concentration lies between 0.05 and 0.06 mg. per 100 ml. of whole blood. The upper limit of safety for lead absorption, as defined by the lead concentration in the blood, lies between 0.07 and 0.08 mg. per 100 grams of whole blood, the latter being the lowest concentration which has been found capable of giving rise to symptoms of intoxication.

Stippled red blood cells and reduction in red cell count or haemoglobin content of the blood may be due to causes other than lead absorption. However, when blood examination of workers is made at regular intervals the appearance of these changes must be considered as strongly suggestive of lead absorption and the need for lead excretion studies is indicated.

*Literature reference, American Public Health Association, "Methods for Determining Lead in Air and in Biological Materials." Revised 1950.

10.1.2.2 *Local Effects*

Lead oxide dust in the eyes acts as a simple irritant such as any simple foreign body. Lead oxide is not a skin irritant.

10.2 PREVENTIVE HEALTH MEASURES

Lead oxide may be handled safely, provided workers are effectively instructed and adequately supervised in the proper handling of the chemical.

10.2.1 Personal Hygiene

Work clothing should be laundered frequently and kept in lockers entirely separate from street clothing. Locker rooms should be ventilated and kept free from dust or fume.

Eating in the workrooms or tobacco chewing should be strictly prohibited. Likewise smoking should be prohibited, except under specified conditions. No food or beverages should be taken into or kept in workrooms or in areas subject to contamination with dust or fume. Water for drinking must be made available under conditions that will guarantee its freedom from contamination but which, because of convenience, encourage its use and aid in avoiding restriction of fluid intake.

Lunchrooms so situated and maintained as to be free of contamination with dust or fume should be provided.

Hands and face should be washed carefully before entering lunchrooms to eat, and care should be taken by appropriate means to avoid the contamination of the lunchroom with dust on clothing and shoes.

Daily shower baths at the end of each work period are recommended.

10.2.2 Physical Examinations

10.2.2.1 *Preplacement Examination*

Prior to assignment to operations involving the handling of lead oxide, applicants should have a careful preplacement physical examination. A careful history of previous industrial work is essential as it often reveals applicants who have previously worked in lead operations, and these applicants should be very carefully examined in order to determine whether or not they have already absorbed excessive quantities of lead.

It is not advisable that those who have the following conditions should be employed in

operations involving the handling of lead oxide under potentially hazardous conditions of exposure:

(a) Any type of anemia.

(b) Syphilis until adequately treated.

(c) Kidney disease.

(d) Disease of the nervous system.

(e) Moderate or severe disease of the heart or circulation.

(f) Evidence of excessive lead absorption.

10.2.2.2 *Periodic Health Examination*

All employees who handle lead oxide should have periodic physical examinations appropriately scheduled in accordance with the potential severity of the hazards of the work in which they are engaged. Samples of blood and urine should be taken for quantitative tests for lead content on a regularly scheduled basis. These schedules should be set up by the plant physician in accordance with the conditions as he finds them, both as the result of his periodic examinations and his observations of plant working conditions. Workers showing symptoms of lead absorption should be excluded from further exposure.

10.3 SUGGESTIONS TO PHYSICIANS

The following literature references are provided for the use of physicians to aid in evaluating the newer but as yet not fully accepted treatment of lead poisoning by the use of chelating agents, such as monocalcium disodium ethylene diamine tetra-acetate, better known as calcium EDTA or by some of its trade names.

A.M.A. ARCHIVES OF INDUSTRIAL HYGIENE AND OCCUPATIONAL MEDICINE, Volume VII, No. 2, February, 1953, "Use of Calcium Ethylene Diamine Tetra-acetate in Treating Heavy-Metal Poisoning," pp. 137-147 and pp. 149-151.

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, Volume 154, No. 14, April 2, 1954, pp. 1171-1175, "Use of Monocalcium Disodium Ethylene Diamine Tetra-acetate in Lead Poisoning," Hardy, et al.

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, Volume 157, January 22, 1955, pp. 341-342, Report to Councils on Industrial Health and Pharmacy and Chemistry by Robert A. Kehoe, M.D., "Misuse of Edathamil Calcium Disodium for Prophylaxis of Lead Poisoning."

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, Volume 160, March 24, 1956, pp. 1042-1044, "Nephrotoxic Hazard from Uncontrolled Edathamil Calcium-Disodium Therapy."

11. FIRST AID

There are no first aid measures for lead intoxication.

The medical information in this publication has been supplied by the Medical Advisory Committee of the Manufacturing Chemists' Association.

CHEMICAL SAFETY DATA SHEETS

Acetaldehyde	(1952)	SD-40
Acetic Acid	(1951)	SD-41
Acetic Anhydride	(1947)	SD-13
Acetylene	(1947)	SD-7
Acrylonitrile	(1949)	SD-31
Aluminum Chloride	(1956)	SD-42
Ammonium Dichromate	(1952)	SD-48
Anhydrous Ammonia	(1952)	SD-8
Aniline	(1947)	SD-17
Aqua Ammonia	(1947)	SD-13
Arsenic Trioxide	(1956)	SD-48
Benzene	(1956)	SD-2
Benzenehexachloride	(1949)	SD-32
Bromine	(1952)	SD-49
Butadiene	(1956)	SD-35
Calcium Carbide	(1948)	SD-23
Carbon Disulfide	(1948)	SD-12
Carbon Tetrachloride	(1946)	SD-3
Caustic Potash	(1947)	SD-10
Caustic Soda	(1947)	SD-9
Chlorosulfonic Acid	(1949)	SD-33
Chromic Acid	(1952)	SD-44
Cresol	(1952)	SD-45
Dimethyl Sulfate	(1947)	SD-19
Ethyl Acetate	(1952)	SD-51
Ethyl Chloride	(1953)	SD-50
Ethyl Ether	(1948)	SD-39
Ethylene Dichloride	(1947)	SD-16
Ethylene Oxide	(1951)	SD-30
Formaldehyde	(1952)	SD-1
Hydrochloric Acid	(1951)	SD-39
Hydrofluoric Acid	(1948)	SD-38
Hydrogen Peroxide	(1952)	SD-52
Hydrogen Sulfide	(1952)	SD-36
Lead Oxides	(1956)	SD-46
Methanol	(1948)	SD-22
Methylamines	(1953)	SD-47
Methyl Bromide	(1949)	SD-34
Methyl Chloride	(1951)	SD-40
Naphthalene	(1956)	SD-53
Nitric Acid	(1947)	SD-5
Nitrobenzene	(1948)	SD-21
Ortho Dichlorobenzene	(1953)	SD-54
Paraformaldehyde	(1952)	SD-6
Perchloroethylene	(1948)	SD-56
Perchloric Acid Solution, preliminary	(1949)	SD-11
Phenol	(1948)	SD-4
Phosphoric Anhydride	(1948)	SD-28
Phosphorus, Elemental	(1947)	SD-14
Phosphorus Oxychloride	(1948)	SD-26
Phosphorus Trichloride	(1948)	SD-27
Phthalic Anhydride	(1956)	SD-61
Propylene	(1956)	SD-57
Sodium Chlorate	(1952)	SD-42
Sodium Cyanide	(1949)	SD-29
Sodium, Metallic	(1952)	SD-47
Sodium and Potassium Dichromates	(1952)	SD-46
Styrene Monomer	(1951)	SD-37
Sulfur Dioxide	(1952)	SD-55
Sulfuric Acid	(1952)	SD-50
Tetrachloroethane	(1949)	SD-54
Toluene	(1956)	SD-60
Trichloroethylene	(1948)	SD-14
Vinyl Chloride	(1954)	SD-58

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The following Manuals of Standard and Recommended Practice are available:

B-1	Handling and Storage of Paper Shipping Sacks when Filled with Chemicals and Allied Products	$ .15
C-1	Carboys (ICC 1A) (For Shipment)	.35
C-2	Carboys (ICC-1A) (For Consignment)	.15
B-30	Drums, Steel (ICC 5A) (For Shipment)	.10
B-31	Drums (ICC-5A) (For Consignment)	.05
B-32	Drums, Steel (ICC 17C and 17F)—When used for shipping flammable liquids flashing between 20° and 80°F.	.20
B-50	Handling and Storage of Fiber Drums	.20
TC-1	Tank Cars—ICC Spec. 103A, Unloading when filled with sulfuric acid or mixed acids and sulfuric acids	.20
TC-2	Tank Cars—ICC Spec. 103B, Rubber-Lined—Unloading when filled with Muriatic Acid, Phosphoric Acid, or other authorized liquids	.15
TC-3	Tank Cars—Unloading when filled with liquid Caustic Soda or Caustic Potash (Revised 1946, 1950, 1952)	.20
TC-4	Tank Cars—Unloading when filled with flammable liquids (Revised, 1953)	.20
TC-6	Tank Cars—Unloading when filled with Phenol	.20
TC-7	Tank Car—Loading and Unloading Platforms	.20
L-1	Warning Labels, Revised, 1956	1.00
	GUIDE FOR SAFETY IN THE CHEMICAL LABORATORY (Order Direct from D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, New Jersey)	4.50

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