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School Materials Safety Manual:

No. 203 Methylene Blue
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◆ SECTION 1 INTRODUCTION

Material Methylene Blue, ca 100%. If using Loeffliers' Bacterial Stain, be aware that it may contain potassium hydroxide and ethyl alcohol as well as methylene blue. Consult Genium's *SMSM*, Nos. 157 and 180.

Synonyms 3,7-Bis(dimethylamino)phenothiazon-5-ium chloride, methylthionine chloride, Panatone, tetramethylthionine chloride, Urolen Blue

Chemical Formula $(C_{16}H_{18}N_3SCl)3H_2O$, medicinal grade; $(C_{16}H_{18}N_3SCl)_2ZnCl_2 \cdot H_2O$, dye

CAS Number 61-73-4, zinc-free (medicinal grade); 26283-09-0, zinc chloride double salt monohydrate (dye).

DOT Classification Not listed as a Hazardous Material for Transportation (49 CFR 172.101)

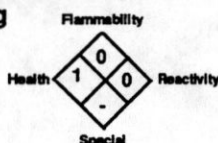
EPA Classification Not listed as a RCRA Hazardous Waste (40 CFR 261.33), a CERCLA Hazardous Substance (40 CFR 302.4), a SARA Extremely Hazardous Substance (40 CFR 355), or a SARA Toxic Chemical (40 CFR 372.65)

OSHA Classification Not listed as an Air Contaminant (29 CFR 1910.1000, Subpart Z)

NFPA Hazard Rating Not found

Genium Hazard Rating

4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Minimum



HMS

H 1
F 0
R 0

Description Odorless (or with a slight odor), dark green crystals or powder with a bronze luster. The aqueous solution is dark blue and supplied in ampules. Obtained by oxidation of *p*-aminodimethylaniline with ferric chloride in the presence of hydrogen sulfide. Used in dyeing cotton, wool, paper, and leather; as a reagent in oxidation-reduction titrations in volumetric analysis, a polymerization inhibitor in some monomeric organics, a weak germicide, and medicinally as an antithemoglobinemic and an antidote for cyanide and nitrate poisoning. *Do not confuse with methyl blue!*

Overview Methylene blue is relatively nontoxic when used according to directions. If ingestion (unlikely) or skin contact occurs, there is the possibility of minor toxicity or irritation. Due to its ability to stain DNA, there is evidence of possible mutagenic potential (Sec. 4). Methylene blue is most likely found in the school environment in the biology laboratory as a bacteriological stain.

Manufacturer Always request an up-to-date MSDS from your chemical supplier. That sheet should include the manufacturer and their emergency phone numbers. This *Manual's* Resources/Manufacturers Index lists some larger manufacturers and available emergency phone numbers.

◆ SECTION 2 USE AND STORAGE DATA

Preliminary Planning Considerations Plan and provide for safe disposal of all school-generated chemical waste. Check applicable regulations prior to use. Provide adequate ventilation or restrict use to fume hood to avoid inhalation of powder dusts. Contact lens use when handling chemical materials is controversial. In some cases, soft lenses can actually protect

eyes from chemicals. In other cases, chemical entrapment is presumed a possible hazard. Particles adhering to contact lens surfaces can cause corneal damage. For safety, always wear safety glasses or goggles. Wear rubber gloves to minimize skin contact. Employees and students should know the location of eyewash and shower facilities near chemical use areas. Check that eyewash stations and safety showers are working properly.

Usage Precautions and Procedure Before using, read this material's container label and follow all precautions. Do not smoke in usage or storage areas. Practice good housekeeping to avoid unintentionally mixing incompatibles. Do not allow chemical residue or dust buildup in lab or work areas. Wear safety glasses or goggles and appropriate protective clothing to work with this substance. Keep methylene blue away from notebooks, textbooks, and personal belongings to avoid transporting chemical residues from the lab/work area. After working with chemical materials, and before eating, drinking, or smoking, always wash hands and face. Remove and launder contaminated clothing before reusing.

Additional Data Methylene blue is stable at room temperature under normal handling and storage conditions. It does not polymerize but is light sensitive. Its incompatibilities include alkali iodides, caustic alkalies, dichromates, and oxidizing and reducing agents. The aqueous solution can be decolorized by zinc dust and dilute sulfuric acid. Color is restored by exposure to air or the addition of ammonium hydroxide. Methylene blue easily forms double salts with many other inorganic salts.

Preferred Storage Location and Methods Store in tightly closed containers in cool, well-ventilated area out of direct sunlight and away from incompatibles. To separate incompatible chemicals, store by chemical family, not by alphabetical name. Protect all chemical containers from physical damage. Prohibit smoking in chemical storage areas. Purchase amounts sufficient for one year's use or less.

◆ SECTION 3 SPILL/DISPOSAL PROCEDURES

If Spilled Ventilate spill area. Promptly and thoroughly clean up spilled material. Cleanup personnel should protect against inhalation and skin or eye contact. For liquid (solution) spills, cover with an inert solid absorbent (vermiculite, dry sand, etc.) and scoop into appropriate containers (with secure lid) for disposal in accordance with existing regulations. As needed, dike spill area with inert absorbent material to contain spill. For dry spills, carefully collect spilled material and scoop into secure disposal or reclamation containers. Avoid creating airborne dust conditions. Vacuum (with appropriate filter) or wet mop to minimize dust dispersion.

Disposal of Small Quantities Handle emptied containers carefully since residues may remain. Always check regulations before disposal. Investigate recycling or reclamation rather than landfill disposal. Small quantities may sometimes be flushed safely down the drain (if local regulations allow). If these methods are not practical, feasible, or in accord with existing regulations, contact your supplier or a licensed disposal contractor for specific treatment/disposal procedures.

Disposal of Larger Amounts Contact your supplier or a licensed disposal company.

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Follow all applicable local, state, and Federal regulations for all waste disposal.

◆ SECTION 4 HEALTH HAZARDS

Methylene blue is nonhazardous if used according to directions and if protected from powder inhalation, skin contact, and accidental ingestion. When large amounts are ingested, toxicity is usually minor although certain (especially G-6-P-D deficient) individuals may be susceptible to red blood cell destruction from methemoglobinemia (chemical alteration of the oxygen-carrying protein hemoglobin making it less able to carry oxygen).

1991-92 ACGIH TLV 8-hr TWA: None established

1990 NIOSH REL 10-hr TWA: None established

1990 OSHA PEL 8-hr TWA: None established

1985-6 Toxicity Data Infant, unreported route, TD_{Lo} : 15 mg/kg produced cyanosis (bluish skin discoloration due to lack of oxygen) and changes in blood. Mammal-lymphocyte: 1830 nmol/L caused DNA damage. Rat, oral, LD_{50} : 1180 mg/kg; toxic effects not yet reviewed. Rat, oral, LD_{Lo} : 2500 mg/kg (1 to 22 days pregnant) produced effects on fertility.

Carcinogenicity Not listed by the IARC, or OSHA. The NTP has assigned methylene blue a high priority for toxicity and carcinogenicity review.

Acute Effects Methylene blue is easily absorbed via ingestion and can cause (after >4 mg/kg) a burning sensation in the mouth, nausea, abdominal and chest pain, headache, profuse sweating, mental confusion, dizziness, difficulty breathing, painful urination, bluish skin discoloration, mucous membranes, and bodily fluids. Skin contact may cause irritation. Methylene blue may color urine, feces, saliva, skin, and mucous membranes blue.

Chronic Effects None reported

◆ SECTION 5 FIRST AID PROCEDURES

Eye Contact Promptly flush eyes with plenty of running water for at least 15 min, including under eyelids. Get prompt medical attention.

Skin Contact After flushing with large amounts of water, wash exposed areas with soap and water.

Inhalation Remove victim from exposure to fresh air and support breathing as necessary.

Ingestion Get *prompt* medical attention. Never give anything by mouth to an unconscious or convulsing person. If large amount are ingested, induce vomiting with 15 mL (child) or 30 mL ipecac (adult).

Get proper in-school, paramedic, or community medical attention and support.

◆ SECTION 6 FIRE PROCEDURES AND DATA

Fire Hazards For major fires, or for fires involving large quantities, firefighters should wear appropriate protective clothing and respirators. Because fire may produce toxic thermal decomposition products, a self-contained breathing apparatus (SCBA) is recommended.

Flash Point and Method None reported

Autoflammability Temperature None reported

Flammability Limits in Air (vol. %) None reported

Hazardous Decomposition Products Thermal oxidative decomposition of methylene blue emits toxic fumes of carbon

monoxide (CO), carbon dioxide (CO₂), chloride (Cl⁻), and sulfur (SO_x), and nitrogen (NO_x) oxides.

Extinguishing Media Use water fog, carbon dioxide (CO₂), dry chemical, foam, or other media appropriate to surrounding fire conditions.

◆ SECTION 7 PHYSICAL DATA

Melting Point 374 °F (190 °C)

Solubility in Water 1 g/25 mL

Other solubilities 1 g/65 mL soluble in alcohol; soluble in chloroform, glacial acetic acid, glycerol, slightly soluble in pyrimidine and insoluble in ether.

pH of Aqueous Solution 1% solution, pH 3 to 4.5

Molecular Weight 319.85

Density (0.05 wt % in water) 0.980

References 101, 124, 126, 127, 132, 145, 527, 528;

Genium's *Material Safety Data Sheets Collection*, No. 658

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