

Safety Data Sheet

4-Dimethylamino- azobenzene

Division of Safety
National Institutes
of Health



WARNING!

THIS COMPOUND IS ABSORBED THROUGH THE SKIN AND THE INTESTINAL TRACT. IT IS TOXIC, CARCINOGENIC, AND MUTAGENIC. AVOID FORMATION AND BREATHING OF AEROSOLS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND WATER.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, DRINK WATER. REFER FOR GASTRIC LAVAGE. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. AVOID SKIN CONTACT OR BREATHING OF AEROSOLS. USE ORGANIC SOLVENT TO DISSOLVE COMPOUND. WASH DOWN AREA WITH SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

A. Background

4-Dimethylaminoazobenzene (DMAB) is a yellow crystalline solid and is stable in the dark but decomposes on exposure to light or heat. It is toxic and carcinogenic to rodents and dogs, with target organs being liver and bladder. DMAB is mutagenic in the Ames test. It is used as a laboratory reagent; its use as a food coloring agent has been discontinued.

B. Chemical and Physical Data

1. Chemical Abstract No.: 60-11-7

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Synonyms :

DAB

Waxoline yellow AD

DMAB

C.I. Solvent yellow 2

C.I. 11020

4-Dimethylaminoazobenzol

Fat yellow

Benzeneazodimethylaniline

Oil yellow

Brilliant fast oil yellow

Fast yellow

N,N-Dimethyl-p-azoaniline

Sudan yellow

Butter yellow (also used for
o-aminoazotoluene)

Methyl yellow

N,N-Dimethyl-4-aminoazobenzene

Dimethyl yellow

4-Dimethylaminophenylazobenzene

Diaminobenzidine

N,N-Dimethyl-p-phenylazoaniline

Resinol yellow GR

Benzenamine, N,N-dimethyl-4-(phenyl
azo)- (9CI)

Cerasine yellow GG

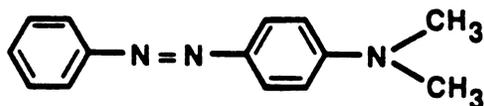
(For other trade names of dyes, see Fairchild et al., 1977.)

Molecular

formula:

$C_{14}H_{15}N_3$

structure:



weight:

225.28

Density: No data.

Absorption spectroscopy: UV (alcohol): λ ($\log \epsilon$) = 410 (4.44).

Volatility: No data.

Solubility: Insoluble in water; soluble in ethanol, benzene, acetone, chloroform, ether, mineral acids and oils, and pyridine.

Description, appearance: Yellow leaflets.

Boiling point: None (decomposes).

Melting point: 114-117°C.

Stability: Stable at room temperature in absence of light;

slowly decomposes, with evolution of nitrogen, when exposed to light and/or heat.

11. Chemical reactivity: Reduced by zinc dust and HCl to hydrazo compounds. Oxidized by hydrogen peroxide, organic peroxides, or potassium dichromate.
12. Flash point: No data.
13. Autoignition temperature: No data.
14. Explosive limits in air: No data.

Fire, Explosion, and Reactivity Hazard Data

1. DMAB does not require special fire-fighting procedures or equipment and does not present unusual fire and explosion hazards.
2. Conditions contributing to instability are heat and exposure to strong artificial light and sunlight.
3. No incompatibilities are known.
4. The toxic hazard of heat or photochemical decomposition products is not known.
5. DMAB does not require nonspark equipment. When handled in flammable solvents, the precautions required for such solvents apply.

Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving DMAB.

1. Chemical inactivation: No validated method reported.
2. Decontamination: Turn off equipment that could be affected by DMAB or the materials used for cleanup. If more than 1 g has been spilled or if there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Wash surfaces with copious quantities of water. Glassware should be rinsed (in a hood) with an organic solvent, followed by soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing DMAB shall be disposed of in sinks or general refuse. Surplus DMAB or chemical waste

streams contaminated with DMAB shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing DMAB shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. Potentially infectious waste (e.g., tissue cultures) containing DMAB shall be disinfected by heat using a standard autoclave treatment and packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with DMAB shall be handled as potentially infectious waste and packaged for incineration, as above. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be handled in accordance with the chemical waste disposal system. Radioactive waste containing DMAB shall be handled in accordance with the NIH radioactive waste disposal system.

4. Storage: Store in sealed ampoules or amber screw-capped bottle (or vials) with Teflon cap liners. Avoid unnecessary exposure to strong artificial light or sunlight.

Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

1. Sampling: No information.
2. Separation and analysis: DMAB is usually determined by TLC, followed by exposure to hydrochloric acid vapors, which turn DMAB spots from yellow to red; this procedure has been used for separation of DMAB from other food colors (Hoodless et al., 1971) and from its metabolites in biological materials (Topham and Westrop, 1964); in the latter application, a detection limit of 0.025 μg has been reported. Weeks et al. (1976) have described a spot test for the detection of DMAB on laboratory surfaces.

Biological Effects (Animal and Human)

1. Absorption: DMAB is absorbed from the gastrointestinal tract and through the skin.
2. Distribution: DMAB and/or its metabolites are strongly bound to certain portions of the liver cell, particularly nuclear fractions.
3. Metabolism and excretion: DMAB is extensively metabolized; reactions include reduction and cleavage of the azo group, demethylation, ring and N-hydroxylation, and conjugation of the hydroxylated metabolites. This has been summarized (IARC, 1975). The major toxic action is related to the binding of DMAB in vivo to liver proteins and to liver and spleen DNA.

4. Toxic effects: The acute oral LD50s of DMAB are 200 and 300 mg/kg in the rat and mouse, respectively. The characteristic acute toxic effect is methemoglobinemia.
5. Carcinogenic effects: DMAB on oral administration produces liver carcinomas in the mouse and rat and bladder tumors in the dog. Details are reviewed by IARC (1975).
6. Mutagenic and teratogenic effects: Mutagenic in the Ames test but not in the mouse dominant lethal mutation test. No data on mammalian teratogenicity.

Emergency Treatment

1. Skin and eye exposure: For skin exposure, remove contaminated clothing and wash skin with soap and water. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes.
2. Ingestion: Drink plenty of water. Refer for gastric lavage.
3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. Refer to physician. Oxygen may be required during transport. Observe for methemoglobinemia.

References

- Fairchild, E.J., R.J. Lewis, Sr., and R.L. Tatken, eds. 1977. Page 96 in Registry of Toxic Effects of Chemical Substances, Vol. II. DHEW Publ. No. (NIOSH) 78-104-B. National Institute for Occupational Safety and Health, Cincinnati, OH.
- Hoodless, R.A., J. Thomson, and J.E. Arnold. 1971. Separation and identification of food colours. Part II. Identification of synthetic oil-soluble food colours using thin-layer chromatography. *J Chromatogr* 56:332-337.
- IARC, International Agency for Research on Cancer. 1975. Pages 125-146 in IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man: Some Aromatic Azo Compounds, Vol. 8. World Health Organization, Geneva, Switzerland.
- Topham, J.C., and J.W. Westrop. 1964. Thin-layer chromatography of 4-dimethylaminoazobenzene and some of its metabolites. *J Chromatogr* 16:233-234.
- Weeks, R.W., B.J. Dean, and S.K. Yasuda. 1976. Detection limits of chemical spot tests toward certain carcinogens on metal, painted and concrete surfaces. *Anal Chem* 48:2227-2233.