CELLULOSE NITRATE

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1.0 SCOPE

This data sheet covers the storage and use of cellulose nitrate as a wetted fiber in drums. Cellulose nitrate is also known as nitrocellulose or pyroxylin plastic.

1.1 Changes

April 2025. Interim revision. Reaffirmed to be technically correct.

2.0 LOSS PREVENTION RECOMMENDATIONS

2.1 Occupancy

2.1.1 Cellulose nitrate fibers and powders should only be stored wetted and in metal drums. Drums should not be opened in storage areas.

2.1.2 Stock should be rotated to ensure that the oldest material is used first.

2.1.3 Handling equipment and personnel practices should be designed to avoid dragging, dropping, puncturing, or otherwise damaging drums.

2.1.4 Factory Mutual Research Approved (see Appendix A, for definition) safety tools should be used for opening drums and handling material.

2.1.5 If any material is spilled, it should be immediately wet with water, preferably by placing it in a pail of water, and safely disposed.

2.1.6 The quantity of cellulose nitrate brought into dispensing or processing areas should be limited to that required for a shift

2.1.7 Cellulose nitrate should not be permitted to dry out. If a drum is opened but not immediately emptied, the material should be amply wet with water or solvent, and the drum tightly resealed.

2.1.8 After emptying, drums should be wiped clean, recovered, and sealed. Used rags should be placed in an Approved waste can, wet down, and disposed of daily.

2.2 Protection

2.2.1 Drums of cellulose nitrate should be stored in separate rooms used only for that purpose. The rooms should be designed and protected as recommended for flammable liquids with flashpoint under 200°F (93°C) in Data Sheet 7-29, *Flammable Liquid Storage in Portable Containers*, with the following modifications:

a) Drums should be stored in an upright position only.

b) If the cellulose nitrate is wetted only with water, natural ventilation is sufficient.

c) For new sprinkler installations, open-head deluge systems actuated by fast acting fire detectors are preferred.

d) The probability of a flowing flammable liquid fire is slight. Drainage requirements may be reduced accordingly. Provide drainage to safely dispose of large quantities of water. Refer to Data Sheet 7-83, *Drainage Systems for Flammable Liquids*.

2.2.2 Rooms used for dispensing or use of cellulose nitrate should be designed and protected as recommended in Data Sheet 7-32, *Flammable Liquid Operations*.

2.2.3 Outdoor storage in drums should be arranged and protected as recommended for outdoor flammable liquid drum storage in Data Sheet 7-29, with the following exceptions:

a) Minimum spacing from important buildings should be 50 ft (15 m).

b) Curbing and drainage is required only as necessary to control large amounts of fire protection water.

2.3 Training

2.3.1 As part of the plant property conservation program, employees should be instructed in the fire hazards and in recommended preventive and protective practices involving the storage and use of cellulose nitrate.

2.4 Contingency Planning

2.4.1 Public and private fire fighters should be fully informed of the hazards of the cellulose nitrate, its conditions of storage and use, and the protective arrangements provided.

3.0 SUPPORT FOR RECOMMENDATIONS

3.1 Discussion

The storage and use of dry, solid cellulose nitrate (pyroxylin) has been largely discontinued because of the development of better substitutes. It is likely to be found only in rare instances, such as the storage of old motion picture film or imported table tennis balls. Since its use is so rare, publication of recommended practices for this material has been discontinued.

Cellulose nitrate is more commonly present, particularly in lacquer manufacturing plants, as a white fibrous, pulp-like material or amorphous powder in steel drums. It is wet with 20 to 30% alcohol or other organic solvent having a flash point not lower than 30°F (-1°C) or wet with 20 to 25% water. For properties and hazards of this material, see Appendix C.

Cellulose nitrate also may be in solution in the form of a lacquer, with low flash point organic solvents. Unless the cellulose nitrate is more concentrated than in normal commercial lacquers, it may be treated as an ordinary flammable liquid with the hazard based on the flash point. Appropriate safeguards should be provided as needed for flammable liquid storage and handling. Where lacquers containing cellulose nitrate are used in spray applications, some special safeguards are needed as specified in Data Sheet 7-27, *Spray Application of Flammable and Combustible Materials*.

4.0 REFERENCES

4.1 FM

Data Sheet 7-27, *Spray Application of Flammable and Combustible Materials*.
Data Sheet 7-29, *Flammable Liquid Storage in Portable Containers*.
Data Sheet 7-32, *Flammable Liquid Operations*.
Data Sheet 7-83, *Drainage Systems for Flammable Liquids*.

4.2 NFPA Standards

Cellulose nitrate in dry form (pyroxylin) is covered by NFPA Standard No. 40, *Standard for Storage and Handling of Cellulose Nitrate Motion Picture Film*, and 42, *Code for the Storage of Pyroxylin Plastic*. Wetted cellulose nitrate in drums (nitrocellulose) is discussed in NFPA No. 35, *Organic Coatings*. There are no conflicts with these standards.

APPENDIX A GLOSSARY OF TERMS

Approved: references to ‘‘Approved’’ in this data sheet means the product and services have satisfied the criteria for Factory Mutual Research Approval. Refer to the *Approval Guide* for a complete listing of products and services that are Factory Mutual Research Approved.

APPENDIX B DOCUMENT REVISION HISTORY

The purpose of this appendix is to capture the changes that were made to this document each time it was published. Please note that section numbers refer specifically to those in the version published on the date shown (i.e., the section numbers are not always the same from version to version).

April 2025. Interim revision. Reaffirmed to be technically correct.

May 2000. This revision of the document has been reorganized to provide a consistent format.

June 1999. This document was restructured and data sheet and NFPA references were updated.

1975 — This document was updated from information provided in the ‘‘Handbook of Industrial Loss Prevention’’.

1990 — The information in this document was reaffirmed.

APPENDIX C HAZARD INFORMATION

The following hazard information on cellulose nitrate is from NFPA 49 - 1975. NFPA 49 has been withdrawn by NFPA but the information on cellulose nitrate is accurate.

CELLULOSE NITRATE (**not explosive grade**) $C_{12}H_{17}(ONO_2)_3O_7$; $C_{12}H_{16}(ONO_2)_4O_6$

DESCRIPTION: A white fibrous, pulp-like material or amorphous powder wet with water, alcohol or some other solvent. It may also be in the form of pyroxylin plastic.

FIRE AND EXPLOSION HAZARDS: Presents an unusually severe fire hazard; when dry, ignites readily and burns explosively. Should never be kept for any appreciable time in any dry fibrous state. Unstabilized product decomposes gradually at relatively low temperature, with evolution of copious volumes of toxic and flammable gases, and rapid heat generation. In prolonged storage and aging of nitrocellulose plastics, camphor is lost with deterioration and the decomposition temperature may be lowered to 100°F. The resulting flameless decomposition is self-sustaining and accelerative, presenting the added hazard of dangerous pressures in building structures.

LIFE HAZARD: Formation of large quantities of extremely toxic gases, notably oxides of nitrogen, hydrogen cyanide and carbon monoxide is possible, as well as the danger of eruptive combustion and explosion. Avoid unnecessary exposure; any person exposed to such fumes should receive immediate medical attention.

PERSONAL PROTECTION: In fire conditions wear self-contained breathing apparatus.

FIRE FIGHTING PHASES: Use extreme caution in approaching fires involving this material as it may explode. No attempt should be made to fight advanced fires, except for remote activation of installed fire extinguishing equipment and/or with unmanned fixed turrets and hose nozzles. The surrounding area should be evacuated. Fires should be approached from upwind and self-contained breathing apparatus used. Since cellulose nitrate supplies its own oxygen, prompt cooling with a large quantity of water is essential; water applied through spray nozzles is effective if used quickly and in sufficient volume, in a manner to wet the entire exposed surface.

USUAL SHIPPING CONTAINERS: Steel drums or barrels, wet with approximately 20% to 35% alcohol, other solvent, or water.

STORAGE: Drums should be protected against damage and not exposed to heating, nor should material be allowed to dry out. Storage should be segregated, well ventilated, and equipped with both decomposition and explosion vents, having the maximum amount of free opening. Protect against excessive heat and direct sunlight, avoid contact with electric light bulbs, steam coils, or other sources of heat; prohibit open flames or other sources of ignition.

REMARKS: NOTE: While cellulose nitrate is no longer used as a film base in the United States (some foreign films may still be made with this material), stocks of old film may be encountered in archival storage, and its use for plastics in the form of lacquers, enamels, playing cards, combs, buttons, fountain pens, eyeglass frames, and drafting instruments, among sundry other uses, continues in commercial importance. Electrical equipment should be in accordance with the National Electrical Code (NFPA No. 70, Article 500), with due consideration given to the material with which the cellulose nitrate is wet and to the possibility of accumulation of nitrate dust.