

In Case of Emergency

55 11 297.0209 (24 hours)

55 11 6137 3100 (M-F 08:00 am - 5pm)

MATERIAL SAFETY DATA SHEET - MSDS

TRADE NAME: NITROCELLULOSE

For Safety, Occupational Health and Environmental Control purpose, it should be informed to the employees, users and customers all data stated in this sheet.

1. PRODUCT IDENTIFICATION

- | | |
|--------------------|---|
| - Chemical name | Cellulose Nitrate |
| - Synonymous | Cellulose Nitrate, Pyroxylin, Colodium Cotton |
| - Chemical Family | Ester |
| - Formula | $[C_6H_{10-x}O_{5-x}(ONO_2)_x]_n$ ($2 < x < 2,4$) |
| - Molecular Weight | 459 up to 594 |
| - UN number | 2556 |

2. COMPOSITION

CHEMICAL NAME	CAS N^o	%
Nitrocellulose (< 12.3% N)	—	65 - 72 (ASTM) 63 - 67 (DIN)
Ethyl Alcohol (wetting Agent)	64-17-5	28 - 35 (ASTM) 33 - 37 (DIN)
Isopropyl Alcohol	67-63-0	28 - 35 (ASTM) 33 - 37 (DIN)

3. PHYSICAL AND CHEMICAL PROPERTIES

- Form: Granular / chip
- Colour: White
- Odour: Alcohols (wetting agents)
- pH - value: Not applicable
- Specific gravity of the cast film: 1,58 - 1,65
- Bulk density: 0,6 (600 kg/m³)
- Water solubility: Insoluble
- Solubility in organic solvents: NC is soluble in esters, ketones ether-alcohol solution, glacial acetic acid and amyl acetate
- Decomposition temperature: Higher than 180 °C
- Flash point of wetting agent: Ethanol: 12°C (closed cup)
Isopropanol: 11.7°C (closed cup)
- Boiling point of w.a.: Ethanol: 78.3 °C
Isopropanol: 82.3 °C
- Explosion Limits of w.a. : Ethanol: 3.3 % (l_{el}) - 19 % (u_{el})
(% Volume) Isopropanol: 2% (l_{el}) - 12 % (u_{el})
- Vapor pressure of w.a.: Ethanol: 40 mmHg at 20 °C (4.4 kPa)
Isopropanol: 33 mmHg at 19 °C (5.33 kPa)

4. RISKS TO HEALTH

Local effects:

- Inhalation: inhaled alcohol vapor may affect the superior aerial system, the respiratory system (depression) .
- Skin and eye absorption: may cause slight irritation, as well as fissures and parched skin.
- Ingestion: toxic due to alcohol presence (may cause hemorrhagic gastritis).

Systemic effects

- Alcohol lengthened inhalation in high concentration, besides the located effects on the eyes and superior respiratory system, may cause headache, drowsiness, quivers and fatigue.

Chronic effects

- Not observed.

If the skin become redness or with blister, get medical attention.

Super-exposure aggravated by health conditions

- Not reported.

5. FIRST - AID PROCEDURES

Emergency procedures and first-aids

- Ingestion: never feeds an unconscious person. If conscious, give large quantities of water (dilution effect). Do not induce vomiting.
- Inhalation: Remove the victim to a ventilated area. If not breathing, give artificial respiration. Call a physician.
- Skin contact: immediately remove the contaminated clothing and wash before reuse. Flush the exposed area with plenty of water and neutral soap. If the skin become redness or with blister, get medical attention immediately.
- Eyes contact: do not allow the victim to keep the eyes closed, carefully hold the eyelids apart and wash continuously with eye - wash solution for at least 15 minutes. Get medical attention as soon as possible.
- General: after administrating the first-aids, look for adequated medical support.

Remarks to the medical attendance:

The treatment must be ministered according to the patient signs.

6. EXPOSURE CONTROL / PERSONAL PROTECTION
--

Exposure Limits:

	TLV - TWA (ACGIH) (ppm)	TLV - STEL (ACGIH) (ppm)
Ethyl Alcohol	1000	-----
Isopropyl Alcohol	400	500

Work environment

- It is deserving to install appropriated exhaustion system, in a way to avoid emanation and consequent alcohol vapor inhalation.
- The work areas must be provided accordingly with safety stations (emergency shower, and wash-eyes).
- Contaminated clothing must be separated from the usual clothes and wash before reuse.
- Keep the *Individual Protection Equipment* clean, very well maintained and accordingly hygienized.
- Concentration of solvent in the workplace atmosphere should be monitored frequently.

Respiratory Protection

- Select appropriated breathing according to work conditions and also concentration of the contaminant, in a way to guarantee the oxygen necessary to workers protection.
- When using the respiratory shield, it's interesting to have a formal respiratory protection program including: periodic and admission medical exams, individual physical test, environmental monitory, respirator maintenance, appropriated local to storage the equipments .

Handling and protection recommended IPEs:

- Clothes (shirt and trousers) made by cotton
- Helmet
- Goggle
- Safety shoes with antistatic base

- Panoramic masks (full face organic respirator)
- Gloves (solvent resistant)

Commentary:

Do not eat, drink or smoke in operational areas. Practice all the appropriate personal hygiene after using the product.

7. FIRE FIGHTING PROCEDURES

- . Burning nitrocellulose can only be extinguished by large quantities of water applied as fog or spray. Take care, the drum lids can be blown off.
- . The alcohol reduces the speed of the nitrocellulose burning, so that, it's important to avoid dryness.
- . If the alcohol evaporates, the nitrocellulose ignition will occur rapidly if exposed to sun and may explode if confined or exposed to impact, friction sparks or static electricity.
- . The nitrocellulose containers may explode under the fire heat action. The nitrocellulose contains O₂ sufficient to self-support the burn, even in atmospheres with low level of O₂.
- . Face to the possibility of toxic products generation by termical decomposition, (Nitrous gases) in case of fire use self-contained breathing apparatus (positive pressure). Apply cooling water on the wall containers even after all the fire extinguished. If a fire occurs in a big dimension in store or shipment areas, use cannon monitor or fire pipes. The residual water used to combat the fire, can not be sent to drain or to any way of disposition without treatment. Keep it in dikes to be arranged future accordingly.
- . After the fire is extinguished, material may be unstable and could re-ignite by itself. Ensure that the residual material is wetted. Keep away curious people, and isolate the area around fire residual.

8. STABILITY AND REACTIVITY

Stability:

- Nitrocellulose is stable if maintained wetted in alcohol or water.
- Dry nitrocellulose is sensible to impact and may explode..
- There is no risk of polymerization.

Chemical incompatibility:

- Nitrocellulose is incompatible with acetic peroxide, bromazide, chlorine, strong oxidizing agents, acids or alkaline products.

Conditions to be avoided:

- Do not expose the product to sunlight, heat or ignition sources, as well as to incompatible products listed above. Do not allow, in any hypothesis, the product become dry. Stability decreases and deterioration starts with increasing temperatures.

Resulting product by decomposition:

- The decomposition by termical oxidizing may produce Carbon Monoxide (CO), Oxides of Nitrogen (No_x) and other potentially toxic fumes.

9. HANDLING AND STORAGE

Handling and storage precautions:

- Nitrocellulose can be stored in steel drums or galvanized drums, in fiber barrel or further, cardboard boxes. The product must be put in antistatic plastic bag. The container must not be arrested on hard surface, as concrete or steel, however it can be inclined or tumbled by the extremity. The storage area must be maintained cool, dry and ensure adequate ventilation, respecting distance from ignition sources and also from products considered incompatibles (see item # 8).
- Do not allow the dryness of the product.
- The storage and work areas must be resistant to fire and it has copious amounts of water. Antistatic footwear, clothing and flooring must be used.
- The container must be opened just by the operational areas, never by the storage area. Use copper tools or other non ferrous material. Tools made of plastic materials must not be used because of their tendency to produce static electricity.
- In case of spilling, immediately gather all the spilled product from the surface or from the equipment to a drum and keep wetted in alcohol or water.
- If it is possible in the Nitrocellulose storage, there is no electrical equipments. If it is necessary, use explosive proof equipments.
- Keep quantity of product in the processing area to a minimum. This would not be expected to exceed the amount necessary for one shift.
- Do not drop, slide, roll or bang the drums.

Engineering control:

- To avoid any health potential risks, use sufficient dilution or local exhaust/ventilation to control the presence of contaminating air, in a way to keep the concentration below the exposure limits.

- To minimizing the explosive risks due to the solvents vapor presence, the electrical equipments must be in the specification class. To avoid electric spark, foresee ground conductor in all equipments (ground continuity)

Administrative control:

- Foresee pre-admission medical exam and also periodic medical exam to the workers exposed to the product.

Hazard Class and Label Name:

- 4.1 Flammable solid.

10. ACCIDENTAL RELEASE MEASURES
--

- Notify the safety people, segregate and keep the place ventilated, prohibit the access to non involved person, remove any ignition sources. The people involved in cleaning area, must be protected against vapor inhalation or skin/eyes contacts.
- Spilled Nitrocellulose must be thoroughly wetted with plenty of water, swept up carefully and kept in tightly closed water tight container.
- Prevent spilled Nitrocellulose from contaminating water courses, sewers, soil or vegetation.

11. DISPOSAL CONSIDERATIONS

- The residue may be treated with an alkali and then send to biological treatment. A nitrocellulose suspension of 5% will be decomposed in cellulose if heated in ammonia water solution of 10%, in a temperature of 75°C, by a period of 8 hours.
- Another disposal way is desnitrate the residue with sodium sulfide and then handle in fine stratum in crematory (no more than 5 cm of height). Do not burn in boiler, or incinerator or in any other closed equipment.
- Alternatively destroy by burning small quantities outside at a safe place in a open fire under competent control. Ignite remotely.
- Packaging: remove all the residual from the plastic bags and wash. Do not reuse the bags. After emptying, the drums must be examined in order to guarantee that all the nitrocellulose was removed (the residual must be eliminated in cleaning cloths). The drums cover must be restored, closed with a metallic link and well tight. The residual cloths must be kept in closed boxes, wet in water.
- Waste disposal should be in accordance with national, state and local environmental regulations.

12. ECOLOGY DATA

- Nitrocellulose: There is no evidence to suggest that NC has any detrimental effect on the environment.
- Wetting agent:

Biological Oxygen Demand (BOD5):	Ethanol (N.D.)	Isopropanol (2.21 mg/l)
Chemical Oxygen Demand (COD):	Ethanol (N.D.)	Isopropanol (2.22 mg/mg)
Bacteria toxicity (EC 50):	Ethanol (1000 mg/l)	Isopropanol (1050 mg/l)
Fish toxicity (LC 50) :	Ethanol (12340 mg/l)	Isopropanol (9280 mg/l)

13. TOXICITY DATA

There is no evidence that Nitrocellulose can cause adverse effects, but the toxicity data on the wetting agents are known:

Ethanol:	LD50 oral (rat):	13700 mg/kg
	LD50 inhal (rat):	20,000 ppm (10h)
Isopropanol:	LD50 oral (rat):	5840 mg/kg
	LD50 oral (rabbit):	6410 mg/kg

14. TRANSPORT INFORMATION

Special transportation caution:

- Road Transport
 - . “ABNT” Rules - Technical Rules of Brazilian Association - to transport dangerous load (NBR’s: 7500, 7503, 7504, 8285, 8286, 9734, 9735).
 - . The vehicle must have the certificate by INMETRO to transport nitrocellulose, Technical Regulation and also observe NB 760.
 - . It must also take IPEs, emergency kits, emergency profile, with an envelope and risks simbology. The vehicle must be in good general conditions; the driver must use adequate clothing, oriented and also take the certificate of Dangerous Products Transportation Course.
 - . IPEs needed: gloves, helmet, goggles and, full face piece organic respirator.
- . The trucks must contain emergency kits as follows:

- ✓ appropriated dimension wedge according to the vehicle weight and wheel diameter;
 - ✓ signaling - 50 meter of bands or cords to isolate the accident area, with arrangement to fix them (ex: easel, tripod, etc.). At least 4 reflective placards printed "Danger" and "keep away"
 - ✓ Arrangement to spilling contention: hoe and shovel non-ferrous
 - ✓ Telephone card, first aid kit and lantern.

- Transport on Passenger Airplanes:
 - . Quantity limitations: 1 kg
 - . packaging with: chinaware, plastic, metal, aluminum, plastic bag, glass blister, fiber.
 - . the package must be resistant to a internal pressure, and also be approved by competent authorities. If it can not be observed, it'll be consider as class 1.

- Transport on Load Airplanes:
 - . Quantity limitations: 15 kg
 - . packaging with: chinaware, plastic, metal, aluminum, plastic bag, glass blister, fiber.

- Maritime and Rail transport
 - . in case of spilling, flammable vapor produced in a closed compartment, can readily form explosive mixtures.
 - . do not ship when package presents spilling or damage.
 - . this substance can be transported in recommended packages since the alcohol content keeps on standard, during the way.

- . Others
 - . Avoid the transport of Nitrocellulose with others materials in the same compartment. Analyze the compatibility of Nitrocellulose with others materials.

15. REGULATORY INFORMATION

- Road transportation
 - . UN number: 2556
 - . Package adequate name: NITROCELLULOSE WITH ALCOHOL
 - . Hazard class: 4.1
 - . Packaging group: II

- Air transportation
 - . IATA class: 4.1
 - . Packaging group: II

- Sea transportation
 - . IMO Class: IMDG Code - page 4159 Amdt. 25-89
 - . UN number: 2556
 - . Package adequate name: NITROCELLULOSE WITH ALCOHOL
 - . Hazard class: 4.1
 - . Packaging group: I (IMDG CODE)
II (49 CFR - Parts 100 to 177)

- Rail transportation
 - . UN number: 2556
 - . Package adequate name: NITROCELLULOSE WITH ALCOHOL
 - . Hazard class: 4.1
 - . Packaging group: II

16. REFERENCES

- Dangerous Properties of Industrial Materials - N. Irving Sax
- Toxic and Hazardous Industrial Chemicals Safety Manual - ITI - 1980
- Material Safety Data Sheet Collection - Genium Publishing Corp. - 1994

- M.S.D.S - Isopropyl Alcohol - Rhodia S/A - Brazilian Manufacturer
- Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices - ACGIH - 1995/1996
- International Maritime Dangerous Goods Code - Volume IV
- Dangerous Goods Regulations - International Air Transport Association 32^o. Edition - 1991
- Brazilian Dangerous Products Road Transport Regulation (D.L. 96.044 - May'88 and Regulation 291 of - May'88)
- Brazilian Dangerous Products Rail Transport Regulation (D.L. 98.973 and Regulation 111 of - March'88).
- Brazilian Environment Control of Legislation Agencies: Statewide, Federal and Municipal.
- Brazilian Dangerous Load of Road Transportation Legislation - Decree 96.044 and Regulation 291
- Brazilian Dangerous Load of Rail Transportation Legislation - Decree 98.973 and Regulation 111
- Code of Federal Regulations - Title 49 - Transportation - parts 100 to 177 - OCT/95
- IATA
- ADR/RID
- NIOSHI, OSHA, ACGIH, MAK
- Consumer Defense Code
- AIHA

The data and information contained in this sheet have a complementary character, provided with good faith and also representing what we have the best about the subject. However, it does not mean that the subject has been completely exhausted. The existing governmental regulations predominate in the data of this sheet.

This sheet was elaborated by Cia Nitro Química Brasileira Industrial Safety and Health Dept.