Contents

Dow Wolff Cellulosics ..................................................... Page 2
Safe Handling, Ignition Hazard, Storage ......................... Page 4
General Precautions
In-Plant Transport ....................................................... Page 5
Handling Free-Flowing NC ........................................... Page 6
Processing .................................................................. Page 8
Liner Concepts .............................................................. Page 8
Handling NC Containers During Emptying ................... Page 10
Waste Disposal, Treatment, Fire-Fighting .................... Page 12
Characteristic Data ...................................................... Page 14
Further Information ..................................................... Page 15
This brochure contains recommendations for handling nitrocellulose on the basis of European Directives. As legislation differs from one country to another, anyone handling nitrocellulose should make themself familiar with and observe the legal requirements and local by-laws and the regulatory codes governing the handling of nitrocellulose.

WALSRODER™ Nitrocellulose used for manufacturing inks and coatings consists of cellulose nitrate with a nitrogen content of less than 12.6 per cent. It contains a damping agent – either water or alcohol – in a quantity of not less than 25 per cent by weight, as required by law, or a gelatinizing plasticizer in a quantity of not less than 18 per cent by weight. Other forms of nitrocellulose are not produced by Dow Wolff Cellulosics and are not dealt with in this brochure.

Lacquer-grade nitrocellulose is itself neither toxic nor hazardous to health. Nitrocellulose is not, however, placed on the market in its pure form, but only with at least 25% alcohol or at least 18% plasticizer in compliance with statutory regulations.

Health hazards can arise from the damping agents or plasticizers and as a result of combustion products formed during fires. Used in the usual damping agent quantity of 30 per cent by weight for damping WALSRODER™ Nitrocellulose, isopropanol is identified on the package label as being Xi (irritant).
Handling

Ignition Hazard

Nitrocellulose can be ignited by a naked flame, sparks, impact, frictional heat, static electricity etc. To prevent ignition, the following measures should be taken in all areas where nitrocellulose is handled:

► There must be conspicuous notices clearly prohibiting smoking and naked flames.
► All electrical installations and equipment (e.g. lighting, switches) must comply with the relevant regulations. Local codes and regulations governing electrical installations and equipment in explosion-hazardous areas must be observed.
► Only non-sparking tools should be used. Suitable tools are made of soft, non-sparking, conductive materials such as bronze, copper or high-grade steel. Standard steel tools must not be used.
► Nitrocellulose containers must be transported carefully and cautiously. They must be protected from any impact, shock and friction. To reduce the risk of frictional heat, WALSDRODER™ Nitrocellulose and WALSDRODER™ NC-Chips are packed in fibreboard or paperboard containers consisting of a material with poor thermal conductivity.

Storage

► Nitrocellulose must be stored in its original packaging only.
► Damped or plasticized nitrocellulose must be kept dry, as they will otherwise become unstable.
► Pallets of free-flowing WALSDRODER™ Nitrocellulose contained in cardboard boxes must only be stacked two pallets high, providing the pallets are in their original wrapping. If the original stretch-wrapping film is no longer in place, the pallets must be stacked on top of one another. Pallets of fibre drums may be stacked three high, provided they are strapped.
► When using WALSDRODER™ Nitrocellulose or WALSDRODER™ NC-Chips, always use the oldest stock first (FIFO). The production date is printed on the label.
► The maximum storage duration for WALSDRODER™ Nitrocellulose and WALSDRODER™ NC-Chips is two years at a maximum temperature of 40 °C (cf. Safety Data Sheet). Exceeding the shelf-life of NC (damped Nitrocellulose as well as NC-chips) could create decomposition of the NC aligned with an increasing risk of a fire. The longer the storage time the higher the risk. It is advisable to use an inventory control system that eliminates a storage duration of more than two years.
► Nitrocellulose containers must not be opened in the storage areas.
► Nitrocellulose containers should not be exposed to direct sunlight for any length of time.
► In most countries nitrocellulose must not be stored together with other dangerous substances, particularly not together with the following:
  • Explosive substances or articles containing explosive substances
  • Gases which have been compressed, liquefied or dissolved under pressure
  • Ignitable liquids such as flammable solvents and formulations containing them, including coatings containing solvents
  • Self-igniting (spontaneously flammable) substances
  • Substances which, when in contact with water, develop ignitable gases
  • Substances with an igniting (oxidizing) action
  • Toxic substances
  • Infectious/contagious substances
  • Radioactive substances
  • Acids and alkaline solutions and other caustic substances
  • Amines

Prohibition regarding the storage of NC together with other hazardous materials applies to all NC storage facilities and should always be observed, unless in other countries other laws and regulations apply. Construction and management of nitrocellulose storage facilities are subject to the laws and regulations applicable in the respective countries.
General Precautions

- Nitrocellulose damped with water or alcohol may dry out if the damping agent is allowed to evaporate. The nitrocellulose is subsequently sensitive to impact and heat (e.g. due to friction). The nitrocellulose container should therefore always be kept tightly sealed to prevent any evaporation. WALSRODER™ Nitrocellulose is packed in containers lined with an antistatic polyethylene (PE) bag which is tightly closed to prevent the contents from drying out. We recommend using up the contents of nitrocellulose drums or cardboard boxes all at once. If only part of the contents is used, the PE bag must be tightly closed again to prevent the damping agent from evaporating.
- Nitrocellulose must not be allowed to come in contact with acids, alkaline solutions, amines or oxidants, as this could cause spontaneous decomposition or even ignition.

In-Plant Transport

- Nitrocellulose containers should be transported with a great deal of caution. Care must be taken to prevent them from sliding, falling and from being dragged or thrown.
- If the containers are transported on pallets, they must be well secured. Drums should be strapped, for instance, and cardboard boxes should be enclosed in the original stretchwrapping film.
- Individual containers should be transported on a drum trolley or sack truck, making sure that the wheels cannot rub against the packaging. Care should be taken to avoid any friction and prevent the containers from sliding or being dragged. Drums may also be rolled upright along their base rim.
Handling Free-Flowing
Open the cardboard box by cutting through the tape along the top.

Lift up the folded upper part of the bag containing the nitrocellulose, so that the sealed seam edge is uppermost.

To open the bag, either cut it below the sealed seam, or open it by vigorously pulling one end of the adhesive tape.

Turn the cardboard box over to empty it. The bag must not be taken out of the box when emptying it. Make sure the box is sufficiently earthed/grounded. This can be done either via an earth/ground clip or via the personnel, which means there must be a conductive floor, conductive footwear and no insulating gloves.

For proper waste disposal, the completely emptied polyethylene bag must finally be removed from the cardboard box outside the danger zone.

The cardboard box should be disposed of through the appropriate industrial waste paper disposal channels.

The PE bags usually still contain nitrocellulose residues. Therefore they should not be disposed of together with normal plastic waste. Prior to disposal, the used PE bags should be kept in such a way that the residual nitrocellulose cannot dry out. This is ensured for instance by collecting and keeping the used bags inside another properly closed PE bag or in a properly closed drum. Disposal should be carried out by an approved waste disposal organization.
Two Concepts for Maximum Safety

**Concept 1**

- **Use of conductive liners**
  
  In this case the use of an earth clip is imperative; earthing via the personnel handling the container is not permissible.

**Concept 2**

- **Use of antistatic liners with non-migrating additives**
  
  In this case earthing/grounding via an earth clip or via the personnel is permissible.

Antistatic liners with non-migrating additives provide enhanced safety as compared with today’s standards and they meet the requirements of the European CENELEC Standard 50404:2003, and in addition they retain their reliable antistatic properties even in particularly critical conditions where the relative humidity is below 30%. Even in such conditions the surface resistivity of these liners is still within the required range between $10^8$ and $10^{11}$ ohms.

Maximum safety is part of the corporate philosophy of Dow Wolff Cellulosics. Therefore, starting in July 2006 the company has gradually changed over from the industrial standard that has been applied over many years to the use of liners with non-migrating additives (Concept 2 of the ENA study). With this concept the processor has the choice of either earthing via an earth terminal (earth clip) or, as is normal practice in most cases, earthing via the operating personnel.

The new packaging concept does not involve any changes whatsoever in the handling procedure recommended by Dow Wolff Cellulosics for emptying packages of NC.
When emptying the NC containers, the liner bags must be earthed to prevent electrostatic discharging. Under CENELEC Standard 50404:2003 two earthing concepts are permissible when antistatic liners are used:

### Concept 1
**Earthing with an earth clip**

Earthing is carried out using an earth clip affixed to the liner and connected with an earth conductor.

The charges can flow through the earth conductor to the ground and a build-up of static electricity is thus safely avoided.

For NC-Chips drums the use of an earth clip to earth the upper metal ring of the drum is imperative, as the NC-Chips drums are not equipped with antistatic liners. It is not necessary to use a liner, as there are no volatile wetting agents like ethanol or isopropanol, which could come out of the NC-chips.

Earthing via the personnel is not permissive.

### Concept 2
**Earthing via personnel**

The second, frequently used option is to earth via the operating personnel. The requirements for safe and reliable earthing are:
- a dissipative floor
- dissipative footwear
- dissipative gloves

In no event may insulating gloves, such as leather gloves, be worn. Electrostatic dissipation via the operating personnel must be assured at all times without restriction.

The liners must remain inside the packaging during the emptying procedure. After the NC has been emptied out of the package, the inliners may be removed.

In accordance with CENELEC 7.3.3.2.2.2.4, in the case of dissipative (antistatic) liners it is sufficient to earth via the personnel. For this reason this earthing concept can be applied with the antistatic liners with non-migrating additives used by Dow Wolff Cellulosics.

This packaging concept and our handling recommendations are based on the CENELEC Standard. The NC user is responsible for observing any local codes and regulations that differ from the above.
The number of nitrocellulose drums kept in the processing area should not exceed the number needed to produce the coating batch. To prevent the nitrocellulose from drying out, the drums should not be opened until the contents are to be used.

There must be a strict ban on smoking and naked flames where NC is handled and in all explosion-hazardous areas. Any work procedures which might generate sparks through friction or impact are to be avoided. When drums of damped nitrocellulose are to be emptied, the top of the antistatic polyethylene liner should be pulled out over the rim of the drum. The bag should not be removed from the drum during the emptying procedure. After the nitrocellulose drum has been carefully emptied, the polyethylene bag should be left inside the drum, which should then be resealed and taken to the storage place for empty containers. In the case of NC packed in cardboard boxes, the boxes and the PE liners should be kept separate after emptying.

Damped nitrocellulose or NC chips can also be transferred to the processing vessel via metal chutes or an intermediate tank which have been earthed (grounded). Any equipment used to facilitate emptying, such as forks, must be made of non-sparking material (e.g. bronze). It is advisable always to completely empty containers of damped nitrocellulose.

Containers which have been partly emptied must be sealed tightly again immediately to prevent the damping agent from evaporating. Care must be taken to ensure that no nitrocellulose gets between the polyethylene bag and the wall of the container where it could dry out.

While the processing vessel is being filled, make sure that different materials are fed one at a time. If several products containing solvents are fed simultaneously into the processing vessel, static electricity may be generated which could lead to sparks being discharged and causing the solvents to ignite.
Disposal of Waste Containing NC

Spilled nitrocellulose should be damped sufficiently with water or alcohol and kept in a tightly-sealed container until disposed of properly. Dissolving NC or NC chips in a suitable solvent such as butyl acetate will facilitate disposal.

The disposal of nitrocellulose or nitrocellulose solution should only be carried out in line with local regulations. In most countries nitrocellulose and waste containing nitrocellulose are categorized as “waste requiring special monitoring”. National and regional waste legislation must be observed during disposal. Disposal may only be carried out in facilities approved by the local authorities.

In accordance with the European Waste List the various paperboard container components meet the following descriptions:

- Cardboard box - 15 01 01 paper and cardboard packaging
- Stretch film - 15 01 02 plastic packaging
- PE bag - 15 01 10 (contaminated by nitrocellulose) packaging containing residues of or contaminated by dangerous substances

Treatment of NC Solutions by Distillation

When treating coatings waste and solutions containing nitrocellulose by distillation, care must be taken to ensure that no amines, peroxides or coatings waste containing any similar substances are added to the nitrocellulose coatings. Substances of this kind can cause the nitrocellulose to decompose in a very violent reaction which can culminate in a gas explosion.

Decomposition can even occur with purely nitrocellulose coatings. Treatment by distillation should therefore never be continued up to total dryness and the temperature should never exceed 100 °C. If the user has had no experience with this form of treatment, preliminary small-scale laboratory tests are advisable.

The distillation vessel must be fitted with a stirrer so that the contents are thoroughly mixed to prevent any localized overheating. Following distillation, the apparatus should be cleaned carefully since any adherent residue can set off decomposition when the equipment is used the next time. Treatment by distillation must be monitored constantly from a safe place.

Fire-Fighting

Water is the only effective agent for extinguishing burning nitrocellulose.

The availability of water in sufficient quantities must be ensured. Provided that only water is used for extinguishing and sufficient oxygen is present, only water, nitrogen and carbon dioxide will be generated. At all NC storage facilities there should therefore be a sign indicating: NC storage area, for fire-extinguishing use water only. All fire-fighting and safety personnel should be instructed that nitrocellulose fires must be extinguished using water only.

Foam and CO₂ are not suitable extinguishing agents as they prevent the presence of sufficient oxygen. If there is insufficient oxygen, nitrous gases may form. If any person(s) is/are suspected to have inhaled nitrous fumes, they should be placed in medical care for 48 hours, as symptoms of poisoning may not occur until after 24 hours.
Automatic sprinkler systems are recommended for storage areas.

Nitrocellulose damped with alcohol has a far higher burning rate than pure solvents such as butyl acetate. NC chips burn even faster (evolving greater heat) than alcohol-damped NC.

The heat generated by fire causes pressure to build up inside the drums. An internal pressure of max. 3 bar will force the lid off the container. Caution must be exercised in the event of fire in case of any flying lids and jets of flame.

Fire-fighting activities should always be carried out from a safe distance.

If there is insufficient oxygen when NC is burning, nitrous fumes may be given off. For this reason, all persons involved in fire-fighting must wear suitable protective clothing and equipment (i.e. overalls providing protection from chemicals, breathing apparatus).

It is recommended that the protective clothing and equipment should also be used during fire-fighting drills.
# Characteristic Data

## Nitrocellulose, Damped or Plasticized

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen content</td>
<td>&lt; 12.6 % in relation to dry mass of NC contained</td>
</tr>
<tr>
<td>CAS No.</td>
<td>9004-70-0</td>
</tr>
<tr>
<td>INDEX No.</td>
<td>603-037-01-3</td>
</tr>
<tr>
<td>UN No.</td>
<td>2555 Nitrocellulose with water</td>
</tr>
<tr>
<td></td>
<td>2556 Nitrocellulose with alcohol</td>
</tr>
<tr>
<td></td>
<td>2557 Nitrocellulose, mixture, with plasticizer without pigment</td>
</tr>
<tr>
<td>Hazard warning symbol</td>
<td>F, highly flammable</td>
</tr>
<tr>
<td>R phrases</td>
<td>R 11: Highly flammable</td>
</tr>
<tr>
<td>S phrases</td>
<td>S 16: Keep away from sources of ignition – No smoking</td>
</tr>
<tr>
<td></td>
<td>S 33: Take precautionary measures against static discharges</td>
</tr>
<tr>
<td></td>
<td>S 37/39: Wear suitable gloves and eye/face protection</td>
</tr>
<tr>
<td>Additionally for isopropanol-damped NC:</td>
<td></td>
</tr>
<tr>
<td>R phrases</td>
<td>R 36: Irritating to eyes</td>
</tr>
<tr>
<td></td>
<td>R 67: Vapours may cause drowsiness and dizziness</td>
</tr>
</tbody>
</table>

## Damping Agents

<table>
<thead>
<tr>
<th>Damping Agent</th>
<th>Ethanol</th>
<th>Isopropanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS No.</td>
<td>64-17-5</td>
<td>67-63-0</td>
</tr>
<tr>
<td>INDEX No.</td>
<td>603-002-00-5</td>
<td>603-117-00-00</td>
</tr>
<tr>
<td>EINECS No.</td>
<td>200-578-6</td>
<td>200-661-7</td>
</tr>
<tr>
<td>Boiling point</td>
<td>78 °C</td>
<td>82 °C</td>
</tr>
<tr>
<td>Density at 20 °C</td>
<td>0.81 g/cm³</td>
<td>0.79 g/cm³</td>
</tr>
<tr>
<td>Ignition temperature</td>
<td>425 °C</td>
<td>425 °C</td>
</tr>
<tr>
<td>Flash point</td>
<td>12 °C</td>
<td>12 °C</td>
</tr>
<tr>
<td>Vapour pressure at 20 °C</td>
<td>59 mbar</td>
<td>41.6 mbar</td>
</tr>
<tr>
<td>Lower explosive limit</td>
<td>3.5 Vol.%</td>
<td>2.0 Vol.%</td>
</tr>
<tr>
<td>Upper explosive limit</td>
<td>15.0 Vol.%</td>
<td>12.0 Vol.%</td>
</tr>
<tr>
<td>German water hazard class</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max. permissible workplace concentration</td>
<td>500 ppm</td>
<td>200 ppm</td>
</tr>
</tbody>
</table>

## Plasticizers

<table>
<thead>
<tr>
<th>Plasticizer</th>
<th>ESO</th>
<th>DIBP</th>
<th>ATBC</th>
<th>ODPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS No.</td>
<td>8013-07-8</td>
<td>84-69-5</td>
<td>77-90-7</td>
<td>1241-94-7</td>
</tr>
<tr>
<td>EINECS No.</td>
<td>232-391-0</td>
<td>201-553-2</td>
<td>201-067-0</td>
<td>214-987-2</td>
</tr>
<tr>
<td>Boiling point</td>
<td>&gt; 250 °C</td>
<td>184 °C</td>
<td>327 °C</td>
<td>n.d.a.*</td>
</tr>
<tr>
<td>Flash point</td>
<td>&gt; 150 °C</td>
<td>169 °C</td>
<td>204 °C</td>
<td>224 °C</td>
</tr>
<tr>
<td>Density at 20 °C</td>
<td>0.99 g/cm³</td>
<td>1.04 g/cm³</td>
<td>1.05 g/cm³</td>
<td>1.09 g/cm³</td>
</tr>
<tr>
<td>Max. permissible workplace concentration</td>
<td>None specified</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

* n.d.a. = no data available

ESO = epoxidised soybean oil, DIBP = diisobutyl phthalate, ATBC = acetyl tributyl citrate, ODPP = octyl diphenyl phosphate
Further Information

- CENELEC Report CLC/TR 50404:2003
  "Electrostatics - Code of practice for the avoidance of hazards due to static electricity," June 2003

- www.dowcellulosics.com

Dow Wolff Cellulosics GmbH
Postfach 1662
D-29656 Walsrode
Tel. +49 51 61 44 - 3535
Fax +49 51 61 44 - 14 3535

Please take notice of the following:

Dow Wolff Cellulosics GmbH & Co. KG ("DWC") has compiled the information in this brochure in good faith. The purpose of the information is solely to give a more detailed description of our products and services and do not take on the significance of data relating to their nature and quality or of guarantees regarding properties or characteristics. Therefore we do not assume any warranty - whether express or implied - with regard to the completeness or correctness of the information given in this brochure. Please also take into account that information may no longer be up to date. In particular application-related information does not relieve you of the duty to test the products as to their suitability for the intended processes and uses. Neither DWC nor any third party involved in the preparation, production or transmission of this brochure is liable for any damage or injury arising from the utilization of this brochure or from the fact that you rely on any information contained in this brochure. Our products are sold on the basis of our latest "General Conditions of Sale" which we will gladly provide you with. This brochure may also contain certain forward-looking statements. These statements use words like "believes", "assumes", "expects" or similar formulations. Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, developments - also of our products - etc. and those expressed or implied by these forward-looking statements. These factors include, among other things:

- downturns in the business cycle of the industries in which we compete;
- new regulations, or changes to existing regulations, that increase our operating costs or otherwise reduce our profitability;
- increases in the price of our raw materials, especially if we are unable to pass these costs along to customers;
- liabilities, especially those incurred as a result of environmental laws or product liability litigation;
- fluctuation in international currency exchange rates as well as changes in the general economic climate;
- and any other factors identified in this brochure.

These factors include those discussed by us or by associated group companies in public reports filed with the Frankfurt Stock Exchange and with the U.S. Securities and Exchange Commission (including Form 20-F). In view of these uncertainties, we caution readers not to place undue reliance on these forward-looking statements. We assume no liability whatsoever to update these forward-looking statements or to conform them to future events or developments.

®™ Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow
Dow Wolff
Cellulosics GmbH
Nitrocellulose

P0 Box 1662
29656 Walsrode, Germany
Tel.: +49 5161 44-3535
Fax: +49 5161 44-143535
E-mail: nitrocellulose@dow.com

If you require any further information please do not hesitate to contact us or visit our website at
www.dowwolffcellulosics.com