Product Stewardship Summary

Chelates: NTA
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Introduction:

Purpose and Scope:

Akzo Nobel Functional Chemicals places high value on health, safety and the environment as an essential part of its business policy. A key aspect of this is the ‘cradle-to-cradle’ management of all products to ensure minimum impact on health, safety and the environment, a process known as Product Stewardship.

To help us achieve the goals of our Product Stewardship initiative, we have prepared informative summaries of our products organized by chemical or functional category. We hope that you will find that they provide a clear and concise description of the chemicals in our products, the potential hazards and the potential for human or environmental exposure to the chemical in all phases of its life cycle. More importantly, we hope you will review the management practices that we have implemented to minimize human and environmental risk from these hazards and exposures.

AkzoNobel Chelates – NTA:

Dissolvine® is the AkzoNobel brand name for products known as chelates, chemicals that control the reactivity and properties of metal ions. Chelates seize a metal ion and control it, which can make it very difficult for another substance to react with the metal ion. Chelates form strong, water-soluble complexes that prevent undesirable precipitation, dissolve scale deposits and optimize oxidation processes. Our Dissolvine® chelate product range includes chelating agents that bind and control metal ions, as well as metal chelates that introduce the right form of metal ions into a product or process.

NTA (Nitrilotriacetic acid) products, particularly the NTANa$_3$ crystals, were once used in large amounts in various household cleaners and detergents in North America. In the 1970s phosphates, which cause water pollution due to eutrophication – were replaced with NTA in laundry detergents. However, it was short lived when NTP and IARC classified NTA and its salts as possibly carcinogenic to humans. The classification effectively ruled out the use of NTA in household cleaners beginning in the mid 1980s in the U.S.

NTA is still used in many cleaners in Canada and in Europe. However, in the U.S. NTA is used almost exclusively in industrial processing operations and for some industrial cleaning applications. In the U.S. few household cleaners are formulated using NTA; therefore, this greatly diminishes human exposure potential. From an environmental standpoint, NTA is beneficial because of its biodegradability. Any new inquires of chelates are usually directed to Dissolvine® GL- a product that is considered safe and is readily biodegradable. We are currently working with current customers of NTA to find other suitable replacement chelate products.
**Category Description:**

Dissolvine® chelating agents combine amine and carboxylic acid chemistry in one molecule. This powerful chemical combination yields aminopolycarboxylates (APCs), which form more stable complexes with metal ions compared to other types of chelating agents. They are stable over a wider range of temperatures and pH values, have a stronger affinity for metals and are significantly more efficient.

Nitrilotriacetic acid and its salts comprise three products sold by AkzoNobel in the U.S. These products are Nitrilotriacetic acid, trisodium salt (NTANa\(_3\)-liquid), Glycine, N,N-bis (carboxymethyl)-, trisodium salt, monohydrate (NTANa\(_3\)-crystals), and Nitrilotriacetic acid (NTAH\(_3\)). Their Dissolvine® product names are A-150-S, A-92, and AZ, respectively.

**Uses – applications, functions:**

NTA products are used as sequestering agents, which are widely used in cleaning processes and detergent applications. They deactivate the unwanted heavy metal ions that are often introduced through raw materials in the manufacture of soap and detergents that contain percarbonates, perborates and peroxides, such as hydrogen peroxide. They boost the effectiveness of biocides and can be used efficiently to soften water and act as a builder in detergents.

Metal salts can cause scaling problems in boilers, heat exchangers and other water circulation systems found in the power, brewing, sugar, and dairy industries. NTA chelating agents form stable, water-soluble metal complexes with all potentially harmful metal ions, dissolving existing scale formations and preventing new scales from forming.

**Physical/chemical properties:**

**Physical Appearance:**

NTAs have similar and different physical and chemical properties. Their physical appearance varies from a clear, pale yellow liquid with a slight ammonia odor, to an odorless white crystalline powder, to an odorless, free-flowing white powder at 25°C. Please refer to specific chemical MSDS for in-depth physical/chemical properties for NTA.

**Special Considerations:**

**Hazardous combustion:**

For Dissolvine® A-92 and AZ products, although not considered flammable or combustible, the potential for dust explosion may exist. Depending upon conditions, dusts may be sensitive to static discharge. Avoid the possibility of dry powder with friction causing static electricity in presence of flammables.

**Incompatibilities:**

Aqueous solutions of NTA in contact with aluminum evolve hydrogen. NTA products are incompatible with strong oxidizers. Avoid contact with aluminum, copper, copper alloys and nickel. Avoid storage at
elevated temperatures. For AZ products, a layer of product on a hot surface may result in glowing or autoignition of the product.

**Decomposition:**
Under fire conditions the product may support combustion. Thermal decomposition products may release toxic and/or hazardous fumes and gases, including nitrogen oxides, carbon oxides and water vapor.

**Health effects:**

**Routes of Exposure:**
Skin, eye, inhalation, and ingestion are the primary routes of exposure.

**Health hazards:**
Effects range from irritation to the skin and eyes, to irritation/discomfort to the respiratory tract through inhalation including gastrointestinal irritation if ingested.

**Toxicity:**
Toxicity ranges from irritation to eyes and skin, to kidney/bladder damage or cancer from chronic exposure. Nitrilotriacetic acid (NTA) and its salts were determined to be “possibly carcinogenic to humans” by IARC, a compound which “may reasonably be anticipated to be a carcinogen” by NTP, and a “select carcinogen” by OSHA. Effects include nausea, vomiting, and diarrhea if ingested.

**Environmental effects:**

Environmental concentrations are estimated to be below those that would harm sensitive aquatic organisms. Therefore, NTA is unlikely to cause ecological harm in the aquatic environment. In addition, NTA is likely to degrade quickly in environmental media. NTA is not entering the environment in a quantity, concentration, or under conditions that have or may have an immediate or long term harmful effect on the environment or its biological diversity. NTA does not meet the criteria for bioaccumulation potential or inherent toxicity to aquatic organisms. NTA is weakly absorbed into soil. Therefore, the elimination of NTA found after passage through soil may be assumed to result from biological degradation. Lastly, NTA does not occur naturally in the environment. The presence of NTA in the environment is a result of its release in sewage from processing, use, and disposal activities.
Exposure – exposure potential:

Acute Exposures:
Safe handling of NTA and its solutions is a high priority at all times. While NTA products are stored, handled, and transported under strictly controlled guidelines, an accidental exposure to NTA may occur. Listed as “possibly carcinogenic to humans,” and acute exposures are minimal, exposure to NTA should be avoided, or at the least minimized.

Proper engineering controls and personal protective equipment will minimize the potential for human exposure. See the section “Risk management – recommended measures” below.

Chronic Exposures:
According to supporting data, chronic exposures to NTA in rats and mice have led to kidney and bladder damage and may lead to cancer.

Regulatory information:

Transport:
Dissolvine® A-150-S is not regulated as a hazardous material as defined by the U.S. Department of Transportation. Outside of the U.S., Dissolvine® A-150-S is classified as a corrosive liquid (basic) and is identified as UN3267. Dissolvine® A-92 and AZ are not regulated for transport.

U.S. domestic land shipments for A-150-S doesn’t require a transport hazard label, while international shipments require corrosive labels.

Worker Safety:
Occupational Exposure Limits have been established by various national and international organizations for the safe handling of some NTAs in the workplace. Proper engineering controls, personal protective equipment and workplace exposure monitoring must be followed to adhere to these standards.

Use and Disposal:
In its unused condition, A-150-S would be considered a RCRA-defined hazardous waste by its characteristic of corrosivity. A-92 and AZ are not considered to be a RCRA-defined hazardous waste by characteristic or listing. The use and disposal of NTA are subject to various national and international laws and regulations. In the U.S., they are subject to TSCA regulation and in the EU are subject to the recently adopted REACH regulations.
Risk management – recommended measures:

**Engineering Controls:**
Special ventilation is usually not required under normal use conditions. However, ensure that existing ventilation is sufficient to prevent the circulation and/or accumulation of vapor/dust in the air. Use local mechanical exhaust ventilation at sources of air contamination such as open process equipment. Please consult the MSDS, PDS, technical bulletins and your AkzoNobel Functional Chemicals representative for specific control measures to be taken.

**Personal Protective Equipment:**
Recommendations include a NIOSH-approved organic vapor respirator with HEPA filters to reduce potential for inhalation exposure. If higher levels of exposure necessitate a higher level of protection, use a NIOSH-approved, positive-pressure, pressure-demand, air-supplied respirator. Replace respirator cartridges or canisters frequently. In addition, protective clothing, boots, and 100% Nitrile gloves are recommended. Chemical goggles and/or face shield should also be worn. A pair of indirect vented dust-tight goggles should be worn when dealing with potential dust exposure. Please consult the MSDS, PDS, technical bulletins and your AkzoNobel Functional Chemicals representative for specific protective equipment measures to be taken.

**Safety Training:**
AkzoNobel believes “Health & Safety are crucial to the quality of operations and often, improving maintenance is the key.” We determine the actions needed to control risky situations. This method ensures an integrated approach that saves costs – and minimizes incidents – in the long term. Our proven success in the safe handling of NTA is due to our long-term commitment to safety. We always place safety as our top priority.

Sharing our experiences in safety is one of the most important resources we offer. Through our safety programs we provide expert advice on the handling of these materials including: classroom review of safety and handling of NTA, consultation of NTA facility and design, demonstrations on the safe use, handling and control of NTA, and on-site assistance and advice regarding procedures.

Our Safety Research Laboratory in Deventer, the Netherlands, is heavily involved in R&D, ensuring the development of safe products and processes. Safety studies are carried out in order to ensure a high level of safety in manufacturing, handling and transport of dangerous substances.

Please contact us if you are interested in such services. Safety and technical support is mainly provided from our laboratory in Deventer, NL.

**References:**

- AkzoNobel Chelate Chemicals Product Material Safety Data Sheets – various
- AkzoNobel Chelate Chemicals Product Data Sheets – various
Environment Canada / Health Canada: Final Screening Assessment for Nitrilotriacetic Acid (CAS #139-13-9), Chemicals Management Plan, Challenge Batch 8, July 2010, 69 pages.

European Commission – European Chemicals Bureau, IUCLID Dataset for Trisodium Nitrilotriacetate (Substance ID # 5064-31-3), February 2000, 351 pages.

Revision History:
Revision 0 – 12 August 2011