



# Nouryon in the mining industry



Serving the mining industry throughout the world

**Nouryon**

# Optimized flotation collectors

We are at the forefront of the advanced colloid and surface chemistry upon which successful flotation depends. This has been achieved by over 50 years of research and development in molecular and surface chemistry, along with feedback from the field.

## Our strengths – optimized solutions

The strength of our chemistry and process know-how lies in the fact that we customize solutions to fit each individual ore. And since the ore varies in composition, we must vary the process and adapt it to each individual case. These products cannot be found in a catalogue, they must be tailor-made in close cooperation with the customer.

There are other ores that would not, at present, benefit from a special flotation agent. Instead, the task is to find a standard flotation agent with the performance characteristics best suited to the ore in question.

Tailor-made or standard collectors – we approach each assignment individually assuming more the role of the customer's partner than that of a traditional supplier.

## For a sustainable future

Our focus is not only to provide highly efficient flotation reagents: it is equally important to focus on a sustainable future. We want and are able to support you with knowledge on the behavior and impact of our collector chemistry in your environment. We achieve this by performing a thorough risk assessment. We are also able to support you in other regulatory affairs. We are backed up by an experienced staff of toxicologists, a worldclass analytical department and last but not least, the experience of our team.

## A wide range of applications

Successful flotation requires optimum interaction of all the components in the flotation process. The main role in this process is usually played by collectors. Collectors must, therefore, meet very high performance requirements. Ideally, collectors should be;



- Strong enough to enhance recovery but weak enough to enhance selectivity.
- Able to provide a high rate of flotation and good froth.
- Non-sensitive to variations in the composition of the ore and the quality of the water.
- Designed to meet environmental requirements.
- Easy to ship, store and handle.
- Cost effective.

We can help improve your enrichment rates if you work with any of the following minerals;

Apatite/phosphate	Graphite	Quartz
Barite	Iron ore	Scheelite
Calcite	Kyanite	Silica
Dephosphorization	Magnesite	Sulfide
Dolomite	Monazite	Wollastonite
Feldspar	Potash	Zinc oxides
Fluorspar	Pyrochlore	

## Our products

Our flotation collectors are recognized under the following trade names; Armeen®, Armoflote®, Atrac®, Berol®, Ethomeen®, Lilaflot® and Tecflote™

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# High-performance additives in froth flotation and pelletization

Performance Additives mining products Depramin and Peridur represent a full range of high-performance Carboxy Methyl Cellulose (CMC) grades already since the 70's. It meets the demands of various applications in froth flotation and agglomeration of fines. The main raw material for Depramin and Peridur is Cellulose, a natural polysaccharide from renewable sources as Cotton and Wood.

## Depramin®

### Application Area

Various types of Depramin have found general acceptance in the flotation of Potash, Pentlandite (Nickel), Copper, lead and Zinc sulfides and Precious metals (Gold, Platinum Group Metals).

### Function

Froth flotation is a physico-chemical separation process based on a difference in hydrophobicity between the desired minerals and the unwanted minerals ("gangue") like talc, serpentine, chlorite, anhydrite. Depramin products render gangue hydrophilic and improves selectivity.

### Products

Depramin is the trade name for a family of watersoluble polymers especially developed for application in froth flotation. Depramin can have a low- or high molecular weight and can have dispersing or coagulating properties.

## Peridur®

### Application Area

Peridur is a formulation based on cellulose, capable of immobilizing water during the pelletizing process giving operators the control need to affect pellet growth rates and sizing.

### Function

Peridur is a non-contaminating organic binder for the agglomeration of iron ore pellets. Unlike Bentonite, Peridur contains no elements like silica or aluminum that would affect (the economics of) the steel making process. Peridur can replace Bentonite or can be used together.

### Products

Peridur is the tradename for a family of watersoluble polymers especially developed for application in Iron Ore Pelletization. All Peridur grades are customized towards the process, ore characteristics and requirements of our clientele.

## Product development and research

Most products are highly customized through close cooperation with customers. Experiments and tests are done at our facilities in Novara (Italy) and Arnhem (the Netherlands), joined trials at customer plants or in collaboration with highly qualified international respected institutes.

Our fundamental understanding about the interaction of Depramin and Peridur with mineral surfaces together with our intensive cooperation with customers and our colleagues from other Nouryon business units, is our key to success.



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# Oxidizing agents for industrial mining application

Eka SC (sodium chlorate) and Eka HP (hydrogen peroxide) are versatile chemicals with excellent oxidative properties that can be utilized in many industrial mining applications. These two products are already widely used in a variety of mining applications such as uranium extraction, cyanide detoxification and various water and off gas cleaning processes.

## Eka HP – hydrogen peroxide

Eka HP can be used in several processing stages in hydrometallurgical processes, e.g. in leaching, separation and refining (purification) operations. Advantages include simplicity of operation (lower capital costs) and reduced effluent production.

Hydrogen peroxide ( $H_2O_2$ ) is a powerful oxidizing agent. Solutions are clear, colorless and water-like in appearance and available in a number of different concentrations; as Eka HP can be mixed with water in any proportion. When handled correctly the risks associated with its use are minimal. The two by-products of the decomposition of hydrogen peroxide are oxygen and water.



## Eka SC – sodium chlorate

Eka SC has been successfully applied in the leaching of sulfide minerals in acidic media and is also used in uranium production where it is used to chemically extract uranium from the mined ore via the production of the partially refined yellow-cake product.

Sodium chlorate ( $NaClO_3$ ) crystal is a white to off-white odorless crystalline solid. It is a very strong oxidizing agent and is very soluble in water and alcohol. Eka SC is available in crystal and solution forms.

## Nouryon Pulp and Performance Chemicals

Our business is a leading global supplier of oxidizing chemicals. Our world class technology, application knowhow, optimized supply chain and global logistics solutions provide customers with a significant advantage for their operations.

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# NaSH, the efficient copper depressor and sulfidizing agent

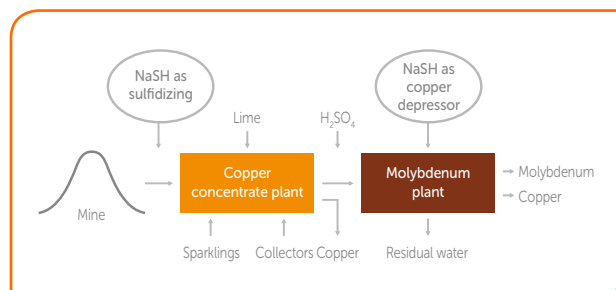
Sulfur Derivates has three manufacturing sites, located in San Lorenzo (Argentina), LeMoyne (USA), and Cologne (Germany). All three sites, produce Sodium Hydrosulfide (NaSH), a widely used copper depressor and ores sulfidizing agent.

## NaSH as copper depressor

The product is used to separate copper from an ores concentrate stream, by depressing it, making use of NaSH's strong potential to generate  $H_2S$  in an acid media. A typical example of this application is the case of Molybdenum Plants, where the molybdenum present in a copper collective concentrate is separated in flotation cells where simultaneous mechanisms of molybdenum flotation and copper depression take place. Other example is the separation of copper traces from Nickel concentrates. In the end, wherever it is necessary to separate copper by depression in flotation cells, NaSH is the most effective reagent to do the job.

## NaSH as sulfidizing agent

The NaSH makes sulfides out of oxide ores. In a flotation process to concentrate sulfide ores where a suitable content of oxides also is present; it is possible to use NaSH to sulfidize the oxides, increasing the ore extraction yield up to 3%, and sometimes even more. In copper mining, the NaSH can be added mainly in two process points: in the entrance to the wenco (pre-rougher) and in the cleaning.



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# Expancel<sup>®</sup> Microspheres, the sensible sensitizer

Expancel Microspheres are inert, hollow, extremely light thermoplastic microspheres, commonly known as “bubbles” or “microballoons” in the mining industry. These microspheres are extensively used as sensitizers in industrial explosives. Coal, metal and quarry mining operations around the world rely on this Nouryon product.

Chemical explosives, specifically those based on ammonium nitrate chemistry, is the primary use. These explosives can be solid, as ammonium nitrate compound, a paste in form of emulsion or mixtures thereof. Typically, the addition of Expancel in explosives range from 0,1 to 0,6 percent by weight depending on the desired density and sensitivity of the finished products and the type of Expancel used.

Expancel Microspheres create consistent uniform voids within the explosives matrix that leads to well balanced control of densities and blasting properties. These properties include: sensitivity to detonation, strength, brisance and stability of explosives.

## Expanded Expancel for emulsion explosives

Expancel DET is a very versatile product, with extremely good chemical resistance and compatibility with ammonium nitrate based emulsions. It is available with different average particle size and a very low density of as low as 15 kg/m<sup>3</sup>. This product is widely used as a sensitizer in bulk emulsions and cartridges mainly for coal mining worldwide but also for metal mining.

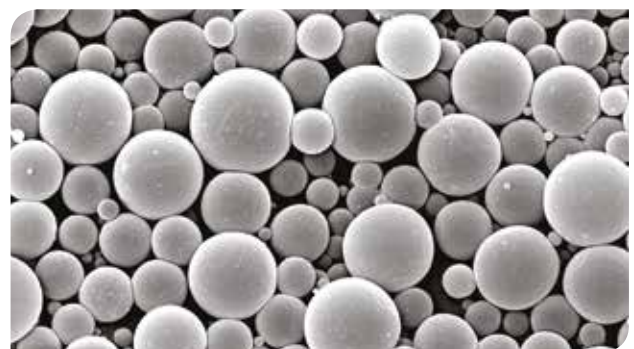
## Unexpanded Expancel for ammonium nitrate (AN) prills

Expancel WU is used as a sensitizer in the production of AN prills. The main use of this product is found in metal mining.

## Expansion unit

Nouryon offers it's customers a unique production equipment for their own in-house expansion of microspheres. This results in benefits like a significant gain in economic and quality values as well as reduced emissions from transports.

Nouryon is the leading provider of expandable microsphere solutions worldwide.



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# Organic peroxides and rubber additives

Our Polymer Chemistry business is the world's leading producer of organic peroxides. We supply essential products used in the production and processing of thermoplastic resins, as well as thermoset and elastomeric materials. We have a long history in the mining industry. But our commitment to superior quality and innovation built into every Nouryon product, remains today.



## The world's leading thermoset curing systems

Our organic peroxides are used for the curing of thermoset resins, coatings and specialty monomers. We are home to the best known brands in the thermoset market, examples include Butanox®, Perkadox® and Trigonox®. In fact, thermoset resin producers the world over recognize the Butanox logo as synonymous with the highest quality methyl ethyl ketone peroxides (MEKP). We also have a whole range of auxiliary products, including our Nouryact™ Cobalt-free accelerators and promoters, to meet your specific production requirements.

## Butanox®



## Chemical anchors and mine bolts

In the mining industry our curing systems find their way in chemical anchors and mine bolts. Chemical anchors and mine bolts are used to fix screws and bolts in rocks, mine walls and bridges by using a body filler. Our products are used in sausage mine bolts and glass tubes. We offer

various dibenzoyl peroxide (BPO) formulations marketed under the brand names of Perkadox 33, Perkadox GB-50X, Perkadox CH-50X and Perkadox 20S.

## Crosslinking peroxides and metal adhesion promoters

Nouryon's crosslinking peroxides are used to improve properties of rubbers and thermoplastic based end-products. The main advantages of peroxide systems over alternative cure systems are excellent resistance against permanent deformation (set properties) and high temperature resistance.

## Conveyor belts, hoses and cables

In mining applications our Perkadox and Trigonox peroxides are used in the production of heat resistance conveyor belts, high pressure hoses and rubber cables.

## Metal adhesion promoter

One of the latest products we have introduced to the market is Perkabond 55 DINP. Perkabond 55 DINP is used to achieve optimal bonding between (zinc coated) steel cords and rubber based materials, thereby improving the durability of the final article. Perkabond 55 DINP finds its main application in conveyor belts.

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We are a global specialty chemicals leader. Markets worldwide rely on our essential chemistry in the manufacture of everyday products such as paper, plastics, building materials, food, pharmaceuticals, and personal care items. Building on our nearly 400-year history, the dedication of our 10,000 employees, and our shared commitment to business growth, strong financial performance, safety, sustainability, and innovation, we have established a world-class business and built strong partnerships with our customers.

We operate in over 80 countries around the world and our portfolio of industry-leading brands includes Eka, Dissolvine, Trigonox, and Berol.

For more information visit [nouryon.com](https://www.nouryon.com)

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