ENERGY & RESOURCES

MINING SOLUTIONS

Elevate Your Mineral Processing to the Next Level

INDORAMA VENTURES

Indispensable Chemistry

MINING

INDOVINYA: WHO WE ARE

Targeting growth markets in daily essentials

Our vision

To be a world-class, innovative downstream chemicals company delivering high-value-added and sustainable solutions for our customers' long-term success. We strive to create value for shareholders, employees, and communities while meeting our sustainability goals.

Through our increasingly sustainable chemistry, designed to carefully meet the needs of each of our customers, we aim to transform our operations and products into something increasingly relevant for the planet.

Key factors of relevance:

#1
nonionic surfactants producer in the Americas

#1
EO producer in the Americas

#2
ethoxylation company globally

- Continuous investments in **capabilities** and **engineering**
- Formulation development and support expertise
- Strong **innovation** and **sustainability** ecosystem
- Powerful tool of **vertical integration** with a unique footprint in the Americas

15 Manufacturing Locations | **7** R&D Centers | **5** Application Labs | Presence in **10** countries | **11** Commercial Offices | **≈3,000** Employees

MINING SOLUTIONS

At Indovinya, we understand that **mined minerals are essential for creating the products we rely on every day**, from agricultural fertilizers and soil enhancers to computers, smartphones, and critical infrastructure. Our commitment to sustainability and innovation drives us to provide high-performance, tailor-made chemical solutions that meet the unique needs of the mining industry.

From our state-of-the-art laboratories to your on-site operations, we provide expert advice, technical support, and innovative products that enhance process efficiency and aid the cost-effective extraction of valuable resources.

Indovinya's emulsifiers for explosives improve blasting efficiency, while our grinding aids increase the effectiveness of milling processes. Our frothers ensure superior recovery of mineral particles, and our dispersants and coagulants are engineered to treat fine particles in aqueous suspension, operating effectively across various pH conditions.

With a global team dedicated to providing the best sustainable solutions, Indovinya is your trusted partner in maximizing operational **performance** and achieving **excellence** in mining.

MINING PROCESS

We are present at Extraction, Processing and Refining stages

Prospection

Development

Extraction ▶ **Processing** ▶ **Refining** ▶ Market

Chemicals for explosives

Enhance blasting efficiency and safety.

Grinding aids

Improve milling process effectiveness and efficiency.

Froth flotation

Ensure superior recovery of mineral particles.

Coagulants

Improve solid-liquid separation for efficient impurity removal.

Dewatering agents

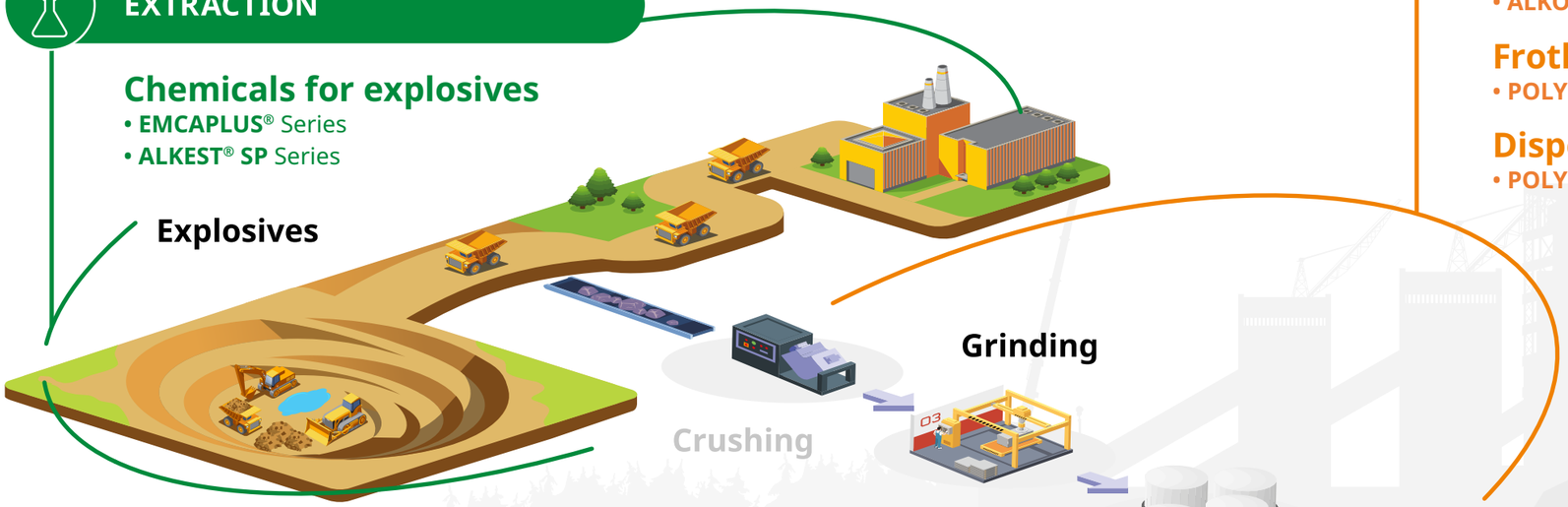
Enhance water removal to optimize metal recovery and waste management.

INDORAMA VENTURES

Mining Process

EXTRACTION

Chemicals for explosives
- **EMCAPLUS®** Series
- **ALKEST® SP** Series



PROCESSING

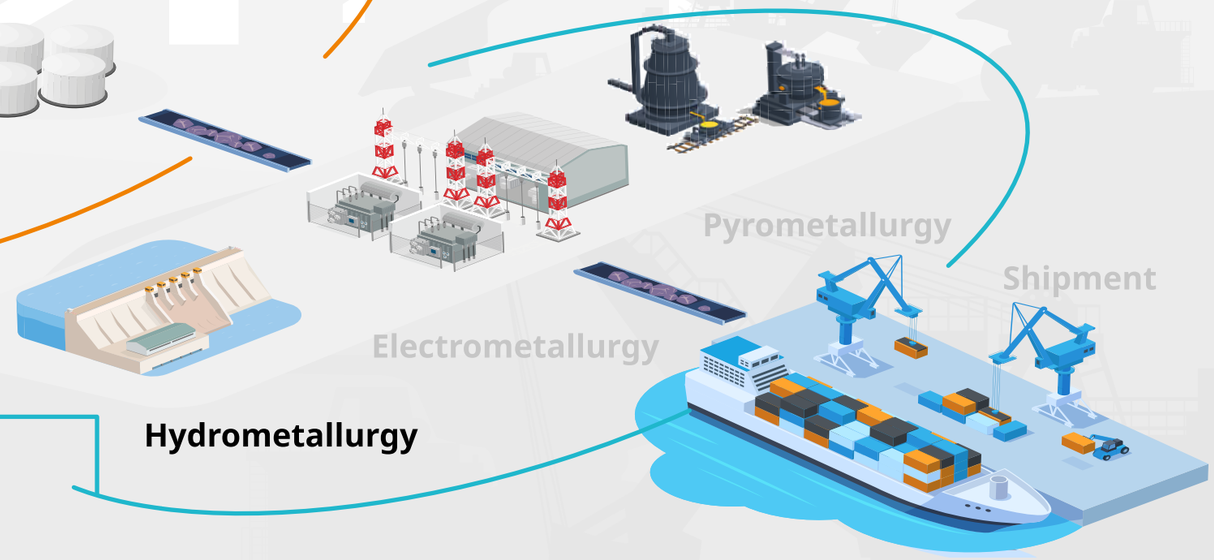
Grinding aids
- **ULTRAPEG®** Series **/ POGOL®** Series
- **ALKONAT® L** Series **/ SURFONIC® L24** Series
- **ALKOSYNT® IT** Series **/ SURFONIC® TDA** Series
- **ALKOSYNT® ID** Series **/ SURFONIC® DA** Series

Froth flotation
- **POLYFROTH®** Series

Depressants
- **UNIMAX®** Series

Dispersants
- **POLYMAX®** Series

Antifoam
- **SURFONIC® POA L** Series **/ ULTRARIC® PE** Series



REFINING

Coagulants
- **POLYSIL® RM** Series

Dewatering agents
- **UNIDRI®** Series

CHEMICALS FOR EXPLOSIVES

Indovinya offers a comprehensive portfolio of solutions designed to help customers to optimize their blasting processes at the critical early stages of mineral extraction. These solutions provide the essential characteristics that enable formulation companies to achieve the precision required for controlled and powerful explosions, facilitating effective excavation and mineral recovery.

EMCAPLUS® Series | Mineral Oil for Emulsions

EMCAPLUS® products, derived from petroleum distillates, have a predominantly paraffinic nature and are supplied in various viscosities and densities. Their low volatile hydrocarbon content allows them to meet diverse formulation and specification needs across different market segments.

Product	Chemical Description	**Density** (g/cm3 @ 68 °F)	**Viscosity** (cSt @ 100 °F)
EMCAPLUS® 125	Mineral Oil	0.84 – 0.86	25 – 27
EMCAPLUS® 180	Mineral Oil	0.84 – 0.87	37 – 39

ALKEST® SP Series | Sorbitan Ester Emulsifiers

The **ALKEST® SP** Series emulsifiers are sorbitan esters with varying carbon chains and HLB values, ideal for creating stable emulsions for explosives even at low agitation rates. They are compatible with various waxes and fuels, making them excellent co-emulsifiers for bulk explosives. These cost-effective emulsifiers ensure rapid viscosity development and are particularly suitable for applications requiring a fast gasification rate.

Product	Chemical Description	HLB
ALKEST® SP 20	Sorbitan Laurate	8.6
ALKEST® SP 60	Sorbitan Stearate	4.7
ALKEST® SP 80	Sorbitan Oleate	4.3

GRINDING AIDS

Adding chemicals in milling operations can increase metal production without requiring major capital investment. Indovinya's products optimize grinding and milling by reducing ore stickiness and slurry viscosity, enhancing particle size reduction, and promoting mineral liberation. They improve the processing of hard-to-grind ores, increase slurry solids, and stabilize slurry properties, leading to better metal recovery. Additionally, these additives save energy, making mineral processing more efficient and sustainable. These additives also save energy, making mineral processing more efficient and sustainable.

ULTRAPEG® / POGOL® Series | Surface Mineral Modifiers

Composed of ethylene oxide polymers of different molar masses and consequently, different viscosity values. They act altering the surface of minerals, reducing cohesion and facilitating grinding/fragmentation.

Product	**Chemical Description**	**Molecular Weight** (Da)	**Appearance** (@ 77 °F)	**Viscosity** (cSt @ 210 °F)
ULTRAPEG® 200 / POGOL® 200	Polyethylene Glycol	190 - 210	Liquid	4 – 5
ULTRAPEG® 600 / POGOL® 600	Polyethylene Glycol	570 - 630	Liquid	10 – 11
ULTRAPEG® 1000	Polyethylene Glycol	950 - 1050	Solid	16 – 19
ULTRAPEG® 4000 F	Polyethylene Glycol	3600 - 4400	Flake	110 - 158

ALKONAT® L / SURFONIC® L24 Series and **ALKOYSNT® / SURFONIC® TDA / SURFONIC® DA** Series | Dispersant Griding Agents

Non-ionic surfactants from the **ALKONAT® L / SURFONIC® L24** Series and **ALKOSYNT® / SURFONIC® TDA / SURFONIC® DA** Series have a dispersing role, contributing for a more efficient grinding process, characterized by the production of particles with finer granulometry and uniform distribution, which can enhance the recovery of valuable minerals in subsequent mineral processing stages.

Product	**Chemical Description**
ALKONAT® L Series / **SURFONIC® L24** Series	Lauryl Alcohol Ethoxylated
ALKOSYNT® IT Series / **SURFONIC® TDA** Series	Isotridecyl Alcohol Ethoxylated
ALKOSYNT® ID Series / **SURFONIC® DA** Series	Isodecyl Alcohol Ethoxylated

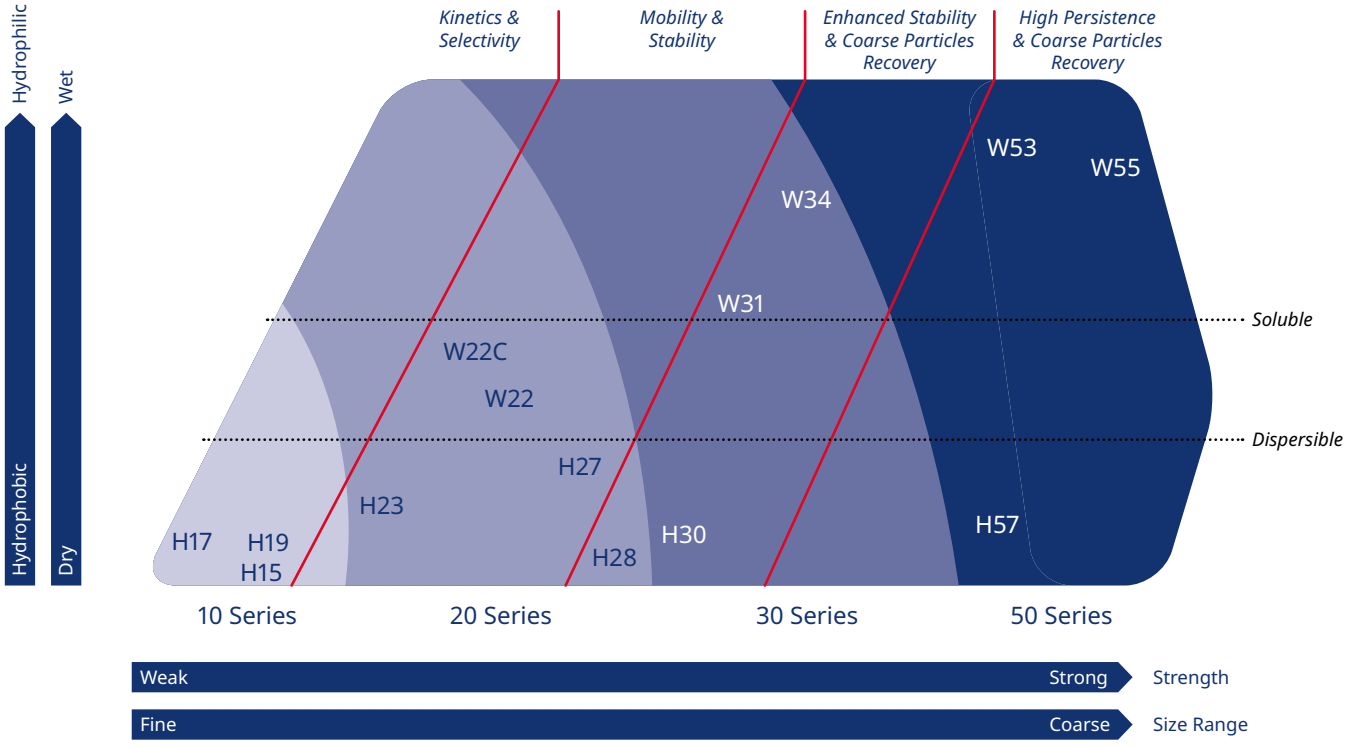
FROTHERS

Indovinya's **POLYFROTH®** Series offers a versatile range of frothers with varying strength levels, designed to produce stable and mobile froths, decrease the wettability of mineral particles, and enhance recovery rates. Leveraging cutting-edge technology, including the froth stability column, we accurately characterize froth formation and decay rates in both two- and three-phase systems, enabling efficient frother screening tests on mineral slurries.

POLYFROTH® require less column air, resulting in cleaner recovery and allowing for deeper froth depths in cleaner columns. This helps to address surges or level control issues that are common with shallower froth depths when using MIBC.

POLYFROTH® Guidance

The product line is divided into series according to their strength, hydrophilicity and particle size range



LOW | POLYFROTH® 10 Series
Selective in base and precious metal flotation, producing a mobile, dry froth with low to moderate stability. Performance is comparable to methyl isobutyl carbinol (MIBC) and low molecular weight alcohol-based frothers.

MEDIUM | POLYFROTH® 20 Series
Highly selective frothers comparable to other low molecular weight alcohol-based frothers. They were specifically designed as high flash point alternatives to MIBC at a significantly lower dosage than that of MIBC. This series also offer blended combinations with stronger hydrophobic glycol ether components, boosting the flotation kinetics and giving higher froth concentrate carry-over (mass pull).

INTERMEDIATE | POLYFROTH® 30 Series
Polyglycol frothers that generate mobile, freely draining froths with intermediate strength. They provide a balance of selectivity, froth stability, and moderate kinetics, making them suitable for various flotation applications. These frothers serve as an alternative to mid-strength, intermediate molecular weight glycol ether/propylene glycol-based frothers.

HIGH | POLYFROTH® 50 Series
Strong frothers with good persistence and stability, ideal for bulk flotation of coarse sulfide particles. They provide fast initial kinetics, help overcome frothing resistance, and enable lower dosage with better froth depth control compared to strong alcohol/polyglycol ether blends. Can be combined with other products to enhance froth characteristics and performance.

FROTHERS

Product	Typical Properties					Ore							
	Water Solubility	Density (@ 68 °F)	Flash Point (°C)	Flash Point (°F)	Dynamic Surface Tension (nM/m, 100 ppm @ 68 °F)	Coal	Cooper	Gold-pyrite	Lead	Molybdenite	Nickel	Potash	Zinc
POLYFROTH® 10 Series are weak frothers and are used for fine particle flotation or where a high degree of selectivity is required													
POLYFROTH® H15	Insoluble	1.194	146	295	71	●	●	●	●				●
POLYFROTH® H17	Insoluble	0.960	72	162	66	●	●	●	●				●
POLYFROTH® H19	Sparingly	1.123	> 100	> 212	69	●	●		●	●		●	
POLYFROTH® 20 Series are low-medium strength frothers with good selectivity													
POLYFROTH® H23	Insoluble	0.870	53	68	127	●	●	●	●	●		●	●
POLYFROTH® H27	Sparingly	0.930	> 70	65	> 158	●	●	●	●	●	●		●
POLYFROTH® H28	Insoluble	0.920	> 70	65	> 158		●			●			●
POLYFROTH® W22	Sparingly	0.923	79	67	174	●	●	●	●	●	●	●	●
POLYFROTH® W22C	Dispersible	0.960	79	67	174	●	●	●	●	●	●	●	●
POLYFROTH® 30 Series are intermediate strength frothers that produce a more stable froth that can be used for coarser particle flotation													
POLYFROTH® H30	Sparingly	1.080	108	60	226	●	●	●			●	●	
POLYFROTH® W31	Soluble	0.980	105	64	221		●	●			●	●	
POLYFROTH® W34	Soluble	1.020	211	65	412		●				●		
POLYFROTH® 50 Series are the strongest in our range and can be used for coarse particle flotation													
POLYFROTH® H57	Sparingly	0.936	101	59	214	●	●	●			●		
POLYFROTH® W53	Soluble	0.980	105	64	311			●			●	●	
POLYFROTH® W55	Soluble	1.015	160	59	320				●			●	

POLYFROTH® W22C

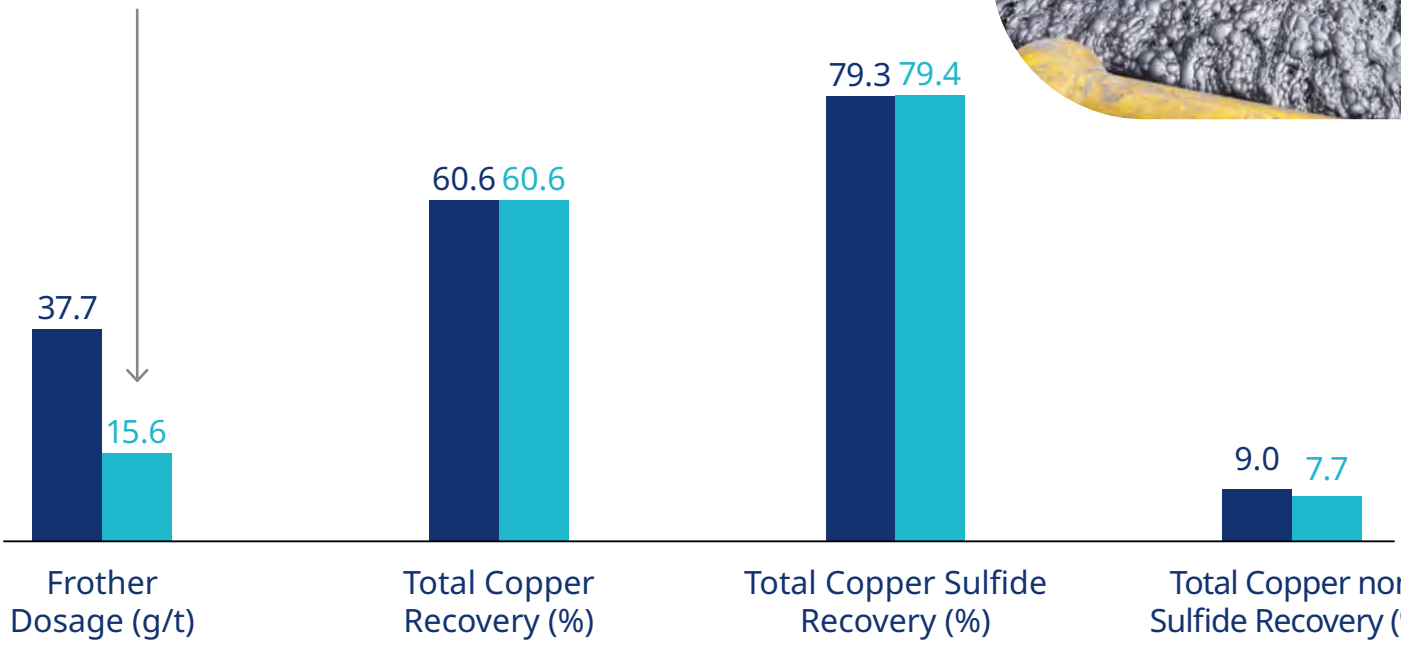
Maximum recovery, lower dosage

Polyoxyalkylene alkyl ether

POLYFROTH® W22C is a non-flammable frother agent designed to enhance mineral processing operations and suitable for a variety of ores including copper, nickel, lead, gold, and zinc. It improves froth cover in rougher scavenger cells, aiding concentrate migration to cell lips. Additionally, it produces dryer froth, reducing gangue slimes carryover for cleaner concentrates.

Froth Flotation Test - Copper

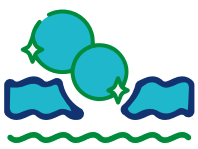
40% reduction in frother dosage with the same performance



Tested at a copper operation in British Columbia, Canada
Total concentration of Copper 24%

MIBC | **POLYFROTH® W22C**

FEATURES



Produces fine bubbles of uniform forth structure.

Non-flammable, dispersible on water and oil soluble.

BENEFITS

Same Copper Recovery with an Overall reduction of 40% in frother dosage.

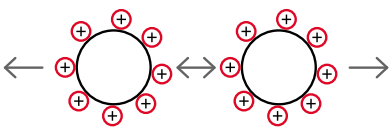
Improved froth stability, froth level controls and concentrate flows in several column cells of the circuit.

DISPERSANTS

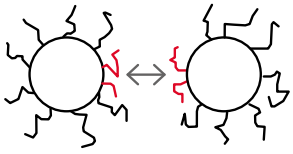
Dispersants are crucial in mining processess, especially for mineral beneficiation. Indovinya's products prevent fine particles from clumping, ensuring efficient processing and higher mineral yields. They also reduce slurry viscosity, saving energy and costs, and improve the final product's quality by maintaining a uniform particle size.

Main Mechanisms of Action

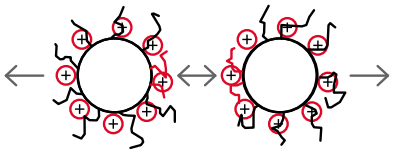
ELECTROSTATIC
Occurs by adding charge to the surface of the particles, promoting electrical repulsion and preventing the particles from coming together and aggregating, ensuring a stable dispersion.



STERIC
Polymer chains or surfactants adsorb onto particle surfaces, forming a physical barrier and creating a steric obstacle that prevents aggregation and maintains colloidal stability.



COMBINATION
This mechanism combines the benefits of both electrostatic and steric stabilization. In this approach, particles are stabilized by both electrostatic repulsion and steric hindrance.



POLYMAX® Series | Mineral Pulp Stabilizer

POLYMAX® G Series are used for carbonaceous or graphitic gangue, typically occurring in sulfide ores. Their fine particle size and porosity provides a high surface area which adsorbs large amounts of reagents. The G series can actively blind and reduce overall high reagent consumption.

POLYMAX® K Series are versatile dispersants used to facilitate the rejection of clays, fibrous minerals and hydrophobic gangue typically found in sulfide ores. Again, these are useful in improving concentrate grades.

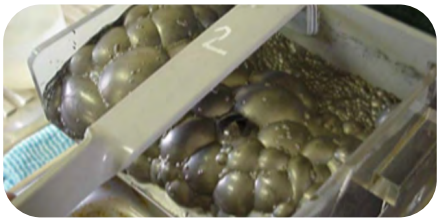
POLYMAX® T Series are aqueous solutions of a high molecular weight poly (oxyalkylene) glycol. They are low foam dispersants, effective for fine gangue particles (dolomites, etc.) and clays. They can also modify froths to reduce entrainment. They are useful for MgO rejection and therefore improving metal recovery in sulfide flotation.

Product	Chemical Description	Mechanism	Typical Applications
POLYMAX® G350	Alkoxylated Alcohols	Steric	Carbonaceous and graphitic ores
POLYMAX® K50	Acrylate Polymer	Combination	Clays, silicates, carbonates and asbestos
POLYMAX® K55	Sulfonate Polymer	Electrostatic	Clays, silicates, carbonates and asbestos
POLYMAX® K56	Alkyl Sulfonate	Electrostatic	Clays, silicates, carbonates and asbestos
POLYMAX® T10	EO/PO Copolymer	Steric	Clays, MgO, dolomites, silicates and talcs
POLYMAX® T12	EO/PO Copolymer	Steric	Clays, MgO, dolomites, silicates and talcs

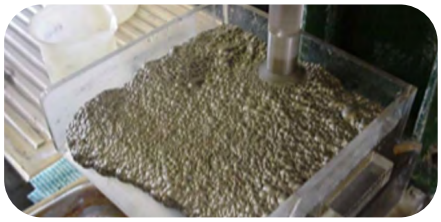
POLYMAX® T10 | The Power of Dispersion for Optimized Benefit

POLYMAX® T10 is an aqueous solution of a high molecular weight polyoxyalkylene glycol. It is a low foam dispersant for talc and magnesium oxides, developed specifically for minerals beneficiation processes.

Leinster Nickel - Australia



Nickel sulphide ore (high talc/MgO)



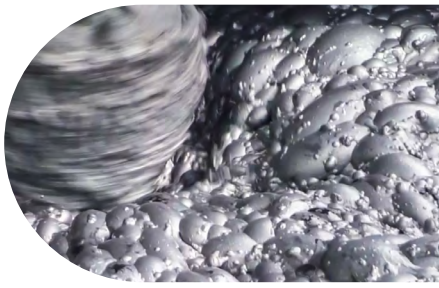
Nickel sulphide ore (high talc/MgO) with addition of 25 g/t of **POLYMAX® T10**

DEPRESSANTS

Depressants are essential in selective flotation, preventing unwanted iron sulfides, such as pyrite, pyrrhotite, and marcasite, from contaminating valuable base metal concentrates. Indovinya's products enhance separation efficiency in flotation circuits, improving the recovery of target minerals.

UNIMAX® Series | Flotation Sulfide Control

Product	Chemical Description	Typical Applications
UNIMAX® SD200	Polyethylene Amine	Iron sulfides and metal sulfides
UNIMAX® SD300	Proprietary	Iron sulfides and metal sulfides
UNIMAX® SD500	Proprietary	Iron sulfides and metal sulfides
UNIMAX® SD600	Polyethylene Amine	Iron sulfides and metal sulfides



UNIMAX® SD500

Sulfide Recovery Enhancer

UNIMAX® SD500 is an innovative depressant developed to improve efficiency in recovery processes for iron sulphides and base metals, including pyrite, pyrrhotite and marcasite. Our exclusive formulation, designed to optimize the flotation process, significantly reduces the carbon content in the concentrate, substantially improving the purity of the final product and increasing the recovery of gold and lead. This innovative approach enables greater efficiency in the process, reducing operational costs and improving the profitability of mining operations.

BASELINE

High carbon content in the 2nd lead concentrate

UNIMAX® SD500

Lower carbon content leading to improved recovery of other minerals

	Rougher Recovery (wt%)			**2nd Cleaner Concentrate Grade** (wt%)		
	79 Au Gold 196.967	82 Pb Lead 207	6 C Carbon 12.011	79 Au Gold 196.967	82 Pb Lead 207	6 C Carbon 12.011
Baseline	46.5	61.9	5.6	0.1	45.5	15.6
UNIMAX® SD500*	68.6	71.3	3.3	0.2	67.7	0.7

*Concentration at 200 g/t

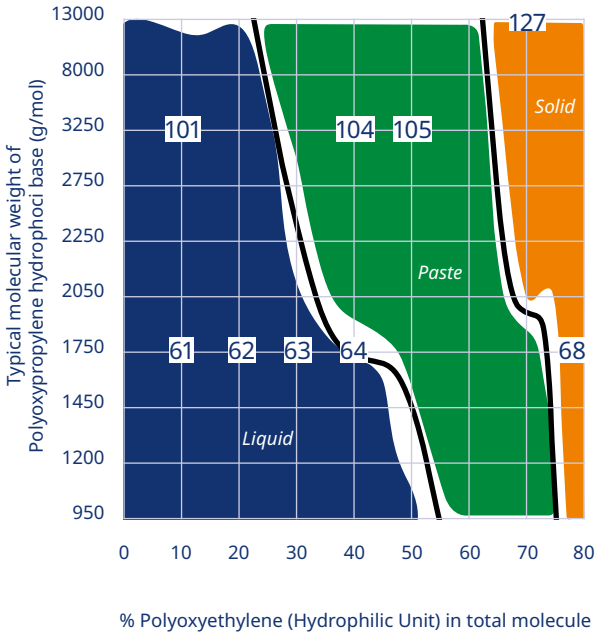
ANTIFOAMS

Defoamers are essential for optimizing mineral processing by effectively controlling foam generation in critical extraction and refining stages. Excessive foam can reduce process efficiency, interfere with solid-liquid separation, and impact equipment performance. Indovinya's advanced formulations ensure stable operation, minimizing entrainment losses and improving the overall recovery of valuable minerals.

ULTRARIC® PE / SURFONIC® POA L Series | Foam Suppression Technology

		Cloud Point			
		1 wt% in water		1 wt% in DEGBE* 25% solution	
Main Brand	**Product**	**°C**	**°F**	**°C**	**°F**
ULTRARIC® PE Series	61	24	75	66	151
	62	34	93	62	144
	63	28	82	> 80	> 176
	64	59	138	> 80	> 176
	68 F	> 80	> 176	> 80	> 176
	68 S	> 80	> 176	> 80	> 176
SURFONIC® POA L Series	101	15	59	11	52
	104	> 80	> 176	> 80	> 176
	105	> 80	> 176	> 80	> 176
	127 F	> 80	> 176	> 80	> 176
	127 S	> 80	> 176	> 80	> 176

*Diethylene Glycol Monobutyl Ether

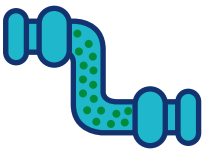


FEATURES

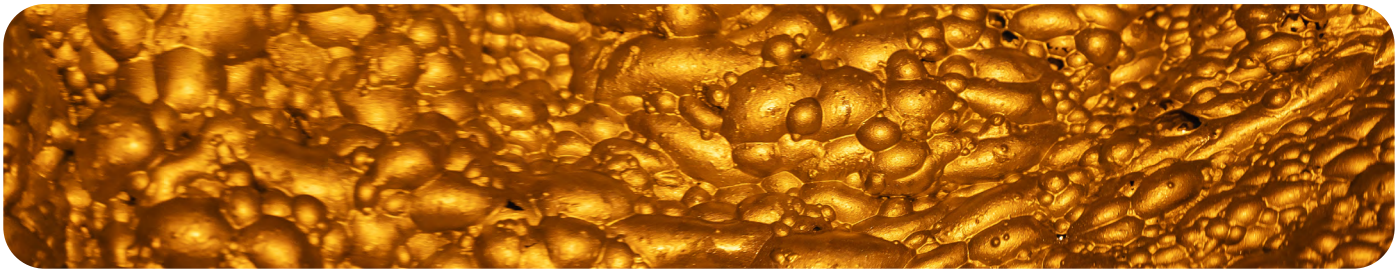
Break air bubbles and reduce foam surface tension.

Optimal equipment performance.

BENEFITS



Prevents blockages.



COAGULANTS

Coagulants are essential in the hydrometallurgy stage, aiding in the extraction and purification of metals using aqueous solutions. Indovinya's products support critical processes such as leaching, solvent extraction, and precipitation, enabling the efficient recovery of valuable metals like copper, uranium, and nickel. This leads to higher yields and improved operational efficiency in metal processing.

POLYSIL® Series | Mining Process Coagulant

Indovinya's **POLYSIL®** coagulants are specifically designed for the mining industry to treat fine particles in aqueous suspension over a broad pH range. These coagulants efficiently remove silica and other fine particles, ensuring effective processing.

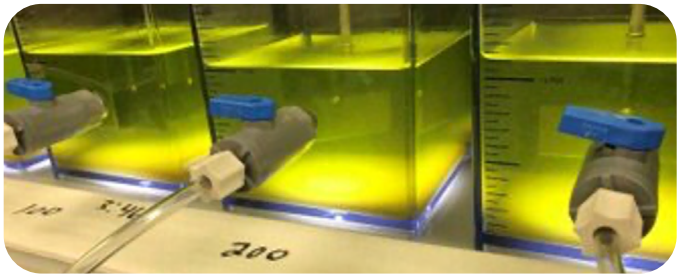
Product	Description
POLYSIL® RM 2150	Liquid Polymeric

Typical Applications: Colloidal silica, crud and fine particles

POLYSIL® RM 2150

Optimized Solid Settling Agent

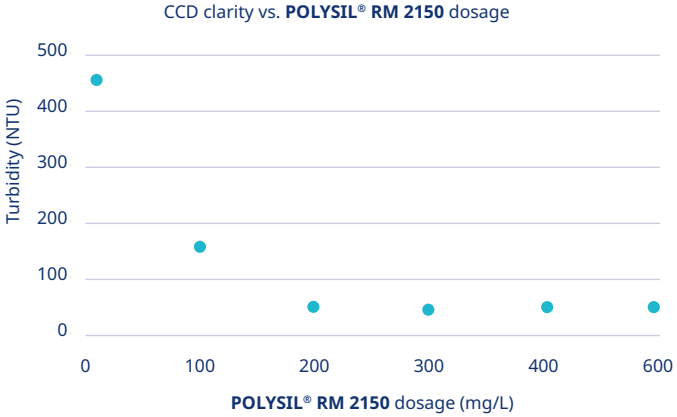
POLYSIL® RM 2150 has a chemical structure that allows it to bind to the surface of colloidal silica particles, displacing water and destabilizing the colloid. When two silica particles come into contact, they form linkages, binding to each other. These newly formed particles then rearrange to minimize their surface area, allowing the coagulant to continue its action on other particles.



Clarity and Settling in Uranium SX Matrix

Canada

Charge-Coupled Device (CCD) clarity in colloidal silica evaluation refers to the measurement of the clarity or transparency of colloidal silica solutions using a CCD camera. This method relies on turbidity measurements, expressed in Nephelometric Turbidity Units (NTU), to evaluate the quality and stability of the colloidal silica. Lower turbidity values indicate fewer impurities and better dispersion of silica particles, which is essential for applications requiring high precision and consistency.



DEWATERING AGENTS

Dewatering agents are essential for managing excessive moisture in mineral concentrates, which can cause cargo instability and increase risks during transportation. Indovinya's products help prevent ore liquefaction and clumping, ensuring safer handling and more efficient processing.

UNIDRI® Series | Mining Dewatering

Product	Chemical Description	Active Content (wt%)
UNIDRI® M40 LV	Anionic Sulfosuccinate	40%
UNIDRI® M60 HF	Anionic Sulfosuccinate	60%
UNIDRI® M70 HF	Anionic Sulfosuccinate	70%
UNIDRI® F47	EO/PO Copolymer	100%

UNIDRI® M40 LV

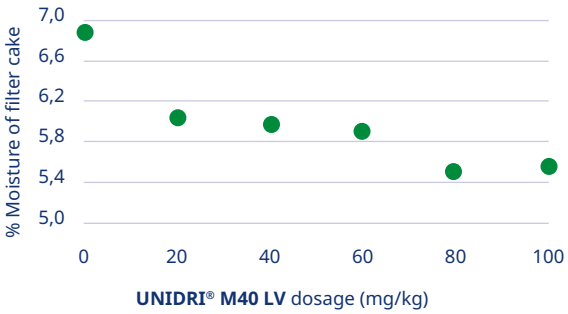
Reducing Moisture Content for Cost Savings

UNIDRI® M40 LV is a powerful dewatering agent designed to optimize the efficiency of iron ore concentration. Its unique formula, based on anionic sulfosuccinate, acts directly to reduce moisture, ensuring a high-quality end product ready for transport.

Rigorous field tests have demonstrated the effectiveness of **UNIDRI® M40 LV**, which, even at low dosages, drastically reduces the moisture content of the filter cake, surpassing conventional options.

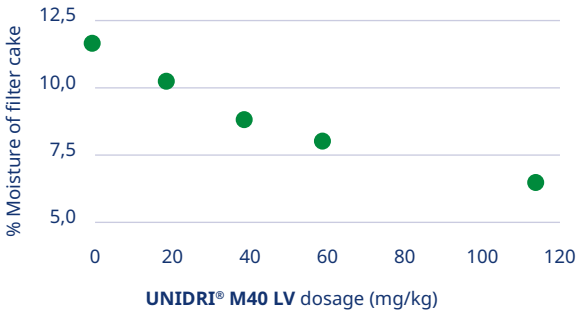
UNIDRI® M40 LV for Brazil iron ore - Mine 1 Sample

Surfactant Dosage (Feed Basis)
vs. % Filter Cake Moisture



UNIDRI® M40 LV for Brazil iron ore - Mine 2 Sample

Surfactant Dosage (Feed Basis)
vs. % Filter Cake Moisture



INDORAMA VENTURES

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