MINING

INNOVATIVE SOLUTIONS FOR INDUSTRIAL MINERAL PROCESSING
With volatile commodity prices, rising energy costs and depleting natural resources, the mining industry today is being challenged to maximize returns from existing and new mine operations by producing more for less. In order to help you meet this challenge, ArrMaz offers a broad range of mining chemicals engineered to optimize your process performance and efficiency.

ArrMaz develops custom reagent formulations and flowsheet designs for customer-specific ores to optimize mineral processing costs, grade and recovery.

We perform comprehensive mineral flotation testing and reagent evaluation in the laboratory and at your plant to adapt the collector to your ore and plant operating parameters.

Our experienced metallurgists and technical experts can provide in-plant consultations to help you solve the most challenging of mineral processing issues.

New mines and prefeasibility studies involve ArrMaz technical experts early on to develop a custom beneficiation flowsheet and reagent design to turn your resource into reality.

We work with you and your engineering firm / metallurgical lab to custom-design reagents specifically for your flowsheet and equipment.

We deliver cost-saving synergies between reagent formulation and flowsheet design using a simplified one-step instead of two-step process thus improving economic viability for new and challenging deposits.

As a global leader in specialty chemicals for the mining industry, ArrMaz is already trusted by many of the world’s leading mineral producers for proven solutions that optimize their operations’ process, performance and product quality. Whether you’re a new mine startup or a long-standing operation, send us your mineral and let us help you discover your ore’s maximum potential.
ArrMaz helps mineral processing companies maximize the potential of finite natural resources by responsibly and sustainably optimizing cost performance, grade and recovery. We offer a broad range of mining chemicals specially formulated for most carbonate / industrial mineral types.

Our application expertise and state-of-the-art flotation laboratories enable us to develop the best product for each application, design the optimal application process, monitor product performance, and adjust formulations as the ore and conditions change.

We offer onsite process consultation as part of our reagent sales package to ensure optimal performance of your operation. We develop a trusted technical service partnership with our customers, creating a formidable technical team focused on maximizing the grade of the product and the amount of ore recovered through your flotation process.

ArrMaz’s specialized surfactant manufacturing enables us to design a unique chemistry specifically for your ore and operating parameters. We are able to offer a chemical solution for a processing challenge, enabling our customers to avoid expensive equipment or flowsheet changes. ArrMaz’s in-house manufacturing enables us to develop unique chemistries to solve your most pressing challenges.

**KEY BENEFITS**

- Better pumping and slurry handling
- Improved water quality
- Optimum pH control
- Better mineral conditioning and enhanced flotation
- Optimum froth and bubble size
- Improved filtration and dewatering

**BETTER MINERAL PROCESSING**

**BETTER CONCENTRATE QUALITY**

- Improved mineral selectivity
- Better mineral grade and recovery

**BETTER OPERATIONAL ECONOMICS**

- Improved process efficiencies
- Better cost performance
- Lower collector dose, lower cost per ton
WATER MANAGEMENT (MINE & PROCESS WATER)
Flocculants & Coagulants (CustoFloc™)
- Better water quality and clarity
- Environmental compliance / clean water to discharge
- More efficient return of water to mineral handling and flotation process
Defoamers (Quell™)
- Reduce foam for improved operational efficiency
- Environmental compliance

WATER CLARIFICATION / CLAY SETTLING / MINE WATER PONDS
Polymers, Flocculants, Coagulants (CustoFloc™)
- Faster, cleaner water back to process
- More efficient clarifier

TAILINGS THICKENING / HANDLING & RECLAMATION
Polymers, Flocculants, Coagulants (CustoFloc™)
- More efficient, faster thickening
- Higher percent solids

SLURRY & MINERAL HANDLING
Rheology Modifiers / Pumping Aids (CustoSperse™)
- Lower energy costs, more tons
- Lower risk of pipeline plugging
CONDITIONING
pH Modifiers (Custo pH®)
- Optimum pH control designed for your ore
- Better selectivity and collector function
- Better froth and lower foam
Promoters (CustoPrep®)
- Enhanced collector performance
- Improved yield and recovery
Depressants (CustoPrep®)
- Better selectivity and grade
Collectors – Anionic, Cationic, Nonionic (CustoFloat®, CustAmine®)
- Custom formulated for your ore
- Better recovery and grade
- Optimal cost performance
- Faster flotation
Co-collectors and Float Oils (CustoFloat®)
- Improved cost performance
- Custom froth control and level
- Improved selectivity, froth depression

GRINDING
Grinding Aids (CustoSperse™)
- Lower energy and equipment erosion
- Optimum mineral liberation, lower fines generation

DESLIMING / SCRUBBING
Dispersants (CustoPrep® and CustoSperse™)
- Better washing and de-sliming
- Improved cyclone efficiency
- Clean mineral surfaces for better conditioning

FLOTATION (PRIMARY, SECONDARY, ROUGHER, CLEANER, SCAVENGER, DIRECT & REVERSE)
Frothers (CustoFroth®)
- Optimum bubble type designed for your mineral size
- Faster and coarser flotation
- Improved grade and recovery
Defoamers (Quell™)
- Efficient froth removal and cleaner launders
- Better pumping and pump box levels

MECHANICAL CELLS
COLUMN CELLS

MINERAL PROCESSING PLANT

CONCENTRATE FILTRATION, DEWATERING / ROCK STORAGE & HANDLING
Dewatering Aids (CustoFloc™)
- More efficient / faster filtration
- Better quality concentrate
MINERALS WE IMPROVE

ArrMaz mining chemicals can be used to aid in the recovery of the following minerals:

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barite</td>
<td><img src="image1" alt="Barite" /></td>
</tr>
<tr>
<td>Calcium Carbonate</td>
<td><img src="image2" alt="Calcium Carbonate" /></td>
</tr>
<tr>
<td>Feldspar</td>
<td><img src="image3" alt="Feldspar" /></td>
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<tr>
<td>Fluorspar</td>
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</tr>
<tr>
<td>Garnet</td>
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<tr>
<td>Kaolin</td>
<td><img src="image6" alt="Kaolin" /></td>
</tr>
<tr>
<td>Lithium</td>
<td><img src="image7" alt="Lithium" /></td>
</tr>
<tr>
<td>Mica</td>
<td><img src="image8" alt="Mica" /></td>
</tr>
<tr>
<td>Phosphate</td>
<td><img src="image9" alt="Phosphate" /></td>
</tr>
<tr>
<td>Potash</td>
<td><img src="image10" alt="Potash" /></td>
</tr>
<tr>
<td>Rare Earths</td>
<td><img src="image11" alt="Rare Earths" /></td>
</tr>
<tr>
<td>Silica / Glass Sand</td>
<td><img src="image12" alt="Silica / Glass Sand" /></td>
</tr>
<tr>
<td>Vermiculite</td>
<td><img src="image13" alt="Vermiculite" /></td>
</tr>
<tr>
<td>And Other Industrial Minerals</td>
<td><img src="image14" alt="And Other Industrial Minerals" /></td>
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</table>
ArrMaz offers a broad range of unique chemistries tailored to overcome the many challenges of the mining industry. We customize and quickly adapt to your changing needs so that you can maximize value in your mineral processing operations.

### MINING CHEMICAL TECHNOLOGIES

**CustAmine® | CustoFloat® | CustoFloc™ | CustoFroth® | Custo pH® | CustoPrep® | CustoSperse™ | Quell™**

<table>
<thead>
<tr>
<th><strong>PRODUCT TYPES</strong></th>
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<th><strong>APPLICATIONS</strong></th>
<th><strong>FEATURES &amp; BENEFITS</strong></th>
</tr>
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<tbody>
<tr>
<td>Anionic Collectors</td>
<td>CustoFloat®</td>
<td>Primary / secondary / reverse beneficiation Carbonate / oxide mineral flotation</td>
<td>Higher recovery, grade, selectivity Lower dose</td>
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<td>Cationic Collectors</td>
<td>CustAmine®</td>
<td>Primary / secondary / reverse beneficiation Silica, silicates, carbonate / oxide minerals</td>
<td>Higher recovery, grade, selectivity Lower dose</td>
</tr>
<tr>
<td>Frothers Surfactants</td>
<td>CustoFroth®</td>
<td>Froth stabilizers Froth modification Flotation promotion Column flotation</td>
<td>Better bubble size and froth structure Improved grade and recovery Optimal surface preparation Strong collector attachment Increased selectivity</td>
</tr>
<tr>
<td>Depressants</td>
<td>CustoPrep®</td>
<td>Mineral depressants Phosphate flotation Potash flotation Ion sequestration</td>
<td>Depress gangue minerals Higher grade and recovery Better selectivity Lower reagent doses</td>
</tr>
<tr>
<td>Defoamers</td>
<td>Quell™</td>
<td>Foam control in launders, pump boxes, process tanks</td>
<td>Better pumping and slurry handling Prevents mineral loss in foam-overs</td>
</tr>
<tr>
<td>Flocculants</td>
<td>CustoFloc™</td>
<td>Water quality in flotation, recycle and environmental discharge</td>
<td>Improved mineral processing and water management Environmental compliance</td>
</tr>
<tr>
<td>Filtration Dewatering Aids</td>
<td>CustoSperse™</td>
<td>Filtration Water removal</td>
<td>Improved filtration Lower surface tension Better process efficiencies</td>
</tr>
<tr>
<td>Float Oils</td>
<td>CustoFloat®</td>
<td>Mineral flotation Froth modification Collector extender</td>
<td>Optimal froth structure Improved grade and recovery Lower dose Environmentally friendly</td>
</tr>
<tr>
<td>pH Modifiers</td>
<td>Custo pH®</td>
<td>Feed preparation Mineral conditioning Gangue suppression</td>
<td>Effective pH control Optimal surface preparation Higher recovery Selectivity improvement</td>
</tr>
<tr>
<td>Rheology Modifiers</td>
<td>CustoSperse™</td>
<td>Slurry handling</td>
<td>Better process efficiencies Lower viscosity Better surface preparation Lower water consumption</td>
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</tbody>
</table>

### THE ARRMAZ ADVANTAGE

Since 1967, ArrMaz has been a trusted partner to mining companies worldwide, delivering innovative chemical solutions for process improvement with superior responsiveness, expert technical advice and outstanding customer support. Some of the world’s largest industrial mineral producers trust ArrMaz’s proven solutions to optimize their process performance and efficiency. Send us your mineral and let us do the same for you.
GLOBAL PRESENCE, LOCAL SUPPORT

ArrMaz has worked on major industrial mineral deposits across the globe. Send us your ore and let us help you discover its potential.

CONTACT ARRMAZ

Contact ArrMaz today to discover how our high-quality custom mining solutions can improve your mineral grade and recovery.

Email Mining@ArrMaz.com for further information.