

# Glycine Leaching Technology

## What is Glycine?

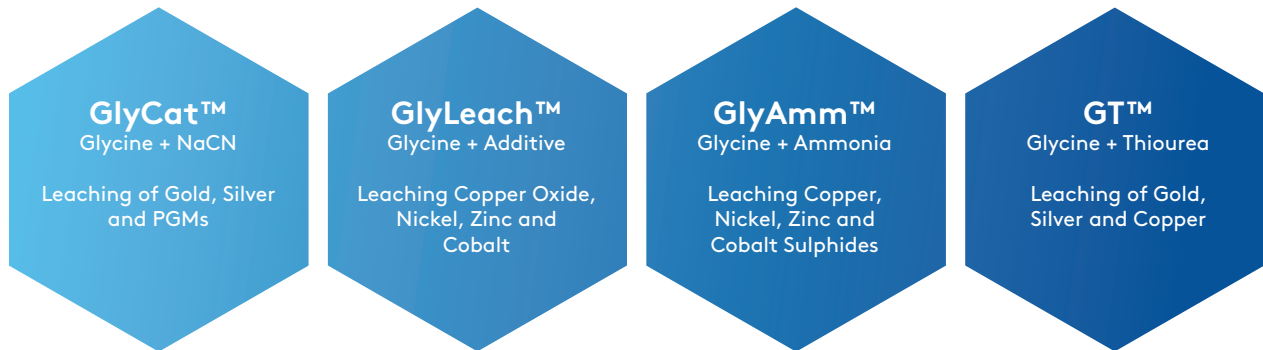
- Glycine is a non-toxic amino acid that is fully bio-degradable.
- It's used as a food additive for both humans and animals and has sugar-like appearance.
- Glycine is generally more cost effective than cyanide.
- It is unique in its ability to selectively leach certain base and precious metals such as gold, copper, nickel, cobalt and silver.
- Glycine is non-volatile and stable under typical gold leaching conditions.
- It's not chemically consumed. As a primary reagent, it's recoverable and recyclable, providing a major cost advantage.
- It's effective with starved levels of cyanide for complex gold ores (gold ore with elevated base metals), and free milling gold ores
- Glycine works well with other lixivants, creating many new hybrid leaching systems.



GLYCINE LEACHING TECHNOLOGY			
Process	Whole of Ore Leaching	Concentrate Leaching	Tailings Leaching
<b>GlyCat™ (Glycine-Cyanide)</b>	Gold ores with copper and other high cyanide consumers	Gold in sulphide concentrates	Gold leaching tailings
	Gold in sulphide ores		Base metal flotation tailings
	PGM sulphides and oxides	PGM sulphide flotation concentrates	PGM sulphide flotation tails
<b>GlyLeach™ (Glycine with Specialized Additives)</b>	Nickel/cobalt sulphide	Nickel/cobalt flotation concentrate	Nickel/cobalts sulphide tailings
	Copper oxide		
	Free milling gold		
	PGM sulphides and oxides	Copper sulphide flotation concentrates	Copper sulphide tailings
<b>GlyAmm™ (Glycine-Ammonia)</b>	Carbonate hosted base metals oxides		
	Sulphide hosted base metals	Copper, nickel and zinc sulphide flotation concentrates	



### Applications of our Glycine Leaching Technologies



### GlyCat™ Technology

The GlyCat™ process offers a simple and effective method to reduce cyanide consumption caused by the presence of base metals in gold ores and concentrates. Reusable glycine is added to the leach to enable a substantial reduction in cyanide usage.

GlyCat™ typically delivers:

- Upto 90% reduction in cyanide consumption, dependant on ore characteristics
- Copper value realization (if present in economic quantities)
- Reduction or elimination of detoxification depending on jurisdictional requirements
- Environmentally friendly reagent
- A simple adoption at existing CIL/CIP plants. Requiring a simple changeover of chemicals added to the leaching stage to a new chemical blend
- Minimal CAPEX to enable recycling

### GlyLeach™ Technology

The GlyLeach™ process is an alkaline leaching process that offers a simple and selective method to extract base and precious metals with very little gangue. Glycine that is added to the leach is recyclable. 50% to 90% of the glycine can be reused, depending on the recovery method deployed.

GlyLeach™ provides the following value:

- It selectively leaches base and precious metals
- Adaptable to all existing downstream recovery methods
- Environmentally friendly reagent
- Transform previously uneconomic ore bodies into profitable projects using glycine
- Easy to implement at existing tank or heap leaching operations. Requiring a simple change over of chemicals

