Improving the flotation of pentlandite ultrafines at the Nova Nickel Operation

<u>*Huett, N*</u>[1]

1. Graduate Metallurgist, IGO, South Perth WA 6151. nerissa.huett@igo.com.au

ABSTRACT

Improving the recovery of ultrafine particles (-7 μm) in froth flotation is a significant challenge in the processing of low-grade disseminated sulfide ores. The depletion of massive nickel sulfides has opened a window for the development of alternative nickel resources, including highly disseminated low-grade nickel sulfide ores to meet the forecasted demand for nickel. Large deficits in nickel supply are expected with the increase in demand for nickel compounds in 'clean energy' storage technologies. The processing of disseminated nickel sulfide ores typically expect high reagent consumption and poor selectivity in froth flotation. Low recoveries are a dominant issue due to poor mineral locking and liberation characteristics. Liberation requirements typically result in high losses of fine particle material to the tailings streams.

Froth flotation is a commonly employed technique for the concentration of sulfide minerals, which exploits the relative differences in mineral surface chemistries to effectively select mineral particles and form stable particle attachments to the bubble to produce a high quality, enriched froth concentrate. Factors influencing the performance and efficiency of froth flotation include particle surface chemistry, pulp chemistry, collision probability, and kinetics. The poor recovery of ultrafine particles during froth flotation is likely attributed to the low probability of bubble-particle attachment of hydrodynamic interactions between the particle and bubble. Low attachment probability arises from the low mass and the low momentum of ultrafine particles, resulting in unstable particle-bubble aggregates.

The impact surface chemistry and pulp chemistry have on froth flotation performance is less understood. Changes in the particle surface chemistry will arise from atmospheric oxidation, grinding media, reagents and/or gangue material in the feed. The pulp chemistry of the system is critical in understanding the reactions occurring within the flotation cell. Determining the optimal pulp chemistry parameters is essential for effective froth flotation for sulfide mineral systems. Additionally, slime coatings (typically MgO-type minerals) will adversely impact froth flotation performance and recovery through alterations in surface chemistry.

This paper therefore investigates the causation of ultrafine nickel losses through understanding the role surface and pulp chemistry has on nickel sulphide systems. Additionally, methods of improving the recovery of ultrafine nickel will be explored.