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Arsenic in complex orebodies

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ABSTRACT

There is an increasing trend in the extraction and development of copper resources from complex deposits. These complex deposits pose mineral processing challenges, as they often contain low grade disseminated copper ore with high levels of impurities particularly arsenic. Arsenic is a naturally occurring element, however its presence in the ore deposit will have production, environmental and human health implications.

The mining industry's approach to life-of-mine planning has improved significantly in recent decades and managing arsenic is not an exception. The inclusion of a process to selectively remove arsenic from copper concentrate to produce a consistently 'clean' product has the potential to reduce mining costs, maximise copper production, facilitate concentrate marketing and reduce costs associated with penalty payments and concentrate blending. Some development work has been undertaken to examine the most effective arsenic treatment option for complex ore bodies that contain arsenic, but a technically robust and economically viable option has not yet been developed. Arsenic treatment options including Pressure Oxidation (POX), Alkaline Sulphide Leach (ASL) or the 'Toowong' process, or ore roasting are very complex, with high capital and operating costs. Research on separation of arsenic-bearing copper sulphides from other copper sulphides, by flotation, indicates that Eh control shows promising results for separating arsenic copper sulphide from other copper sulphides, due to the strong Eh dependence of arsenic mineral flotation. Further process development and economic modelling is required to better define the selective flotation process that may be incorporated into the project with the required level of confidence.

This study provides an overview of the occurrences of arsenic in the full spectrum of activities across copper operation as well as potential environmental and health impacts. It focuses on the value of taking into consideration a processing strategy of arsenic-bearing copper ores using a combination of ore geochemistry and mineralogical characterisation followed by flotation assessment and environmental evaluation. The findings can be applied to develop arsenic bearing copper mineral resources and reduce the associated costs and environmental impacts.