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EXTRACTION OF NICKEL AND COBALT FROM DIFFERENT RESOURCES USING ALKALINE GLYCINE SOLUTIONS

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ABSTRACT

The WA School of Mines at Curtin University has led research in the green extraction of nickel and cobalt form a range of sulfide and oxide (primary and secondary) resources, and the subsequent recovery of the metals from solutions using a highly selective leach approach. The patented technology will be discussed in relation to the performance of this technology on ores, concentrates, and tailings and process intermediates. The technology utilizes an alkaline glycine approach in conjunction with an oxidant and which may have additional catalysts to selectively recover nickel and cobalt from a diverse range of resources in an environmentally friendly approach that eliminates the need for aggressive acids, high pressure or smelting and converting (and associated flue-gas treatment).

It has been shown that recoveries for nickel of more than 85% can be obtained on disseminated nickel sulfide ore, greater than 93% on concentrates and greater than 50% on tailings within practical and feasible residence times. Metal contaminants such as Si, Mg, Fe, Cr, Al, and Mn are essentially eliminated during the leach providing clean leachates of glycine-chelated Ni, Co, Cu, Zn. Ion exchange or solvent extraction or sulphide precipitation can be used to recover the metals from solutions. The optimum leach conditions were found to be pH 10, 35 °C and at 4:1 molar ratio of glycine to total metals. The technology allows high selective recovery at atmospheric pressure, mild (ambient or slightly above) temperatures, and using non-exotic materials of construction combined with a safe working environment. The choice of alkalising agent and dissolved oxygen requirement were found to be important considerations that depended on the mineralogy and composition of the ore/concentrate of tailings materials treated.

Keywords: Nickel, Cobalt, Battery Metals, Leaching, Hydrometallurgy, Glycine