## Geometallurgy of the Olympic Cu-Au Province Deposits, South Australia

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The Olympic Dam Fe-oxide Cu-U-Au-Ag (IOCG) deposit not only contains elevated concentrations of Cu, U, Au, Ag but also a diverse range of currently, non-revenue elements including, but not limited to, REEs, F, C, S, As, Se, Bi, Te, Sb, Co, Zn, Pb, Mo, Sn, W. These elements, along with the typical gangue mineralogy elements such as Na, Mg, Al, Si, P, K, Ca, Ti, Mn, Sr, Ba occur in >125 minerals. This suite of elements/minerals is also characteristic of the other IOCG deposits (Oak Dam, Prominent Hill, Carrapateena) in the Olympic Cu-Au Province, although the absolute concentrations of the elements/minerals do vary at each deposit.

Geometallurgy aims to relate the deposit chemistry and mineralogy to the important metallurgical responses for the operations. At Olympic Dam the processing plant consists of 1) grinding/flotation, Cu-concentrate smelting and then electrorefining to produce Cu-cathode and Au-Ag bullion, 2) flotation tailings leach, solvent extraction, U-calcining and electrowinning (EW) to produce UOC and EW Cu-cathode, and 3) tailings storage. The processing circuits at Prominent Hill and Carrapateena consist 1) grinding/flotation to produce copper sulfide concentrates and 2) tailings storage.

Copper occurs predominately as chalcopyrite, bornite, chalcocite with significantly lesser amounts of covellite and native Cu. Because the sulfides (including pyrite) are all primary, with very minor post mineral oxidation, sulfide flotation recovery is high. The Cu-concentrate grade is controlled by the relative sulfide abundances. Sulfide concentrate impurities (e.g. As, Bi, Sb, Se, Te, Zn, Pb, Co, Mo, F, U) depend on their absolute concentrations, associations with primary sulfides and processing routes. The gangue minerals largely impact materials handling processes such as grinding, leaching (at Olympic Dam only), solid-liquid separation and ultimately tailings disposal. The geometallurgical learnings from the operating mines are part of the technical studies supporting the ongoing development of the Oak Dam deposit.