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HILLGROVE RESOURCES

Bismuth distribution in the Cu-Au Mineralisation of the Kanmantoo Deposit, South Australia

Honours Thesis

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ABSTRACT

Bismuth at the Kanmantoo Cu-Au mineralisation, South Australia, exists as an unwanted accessory element. Despite extensive recent work, its distribution and genetic behaviour are largely unanswered. Methods ranging from core logging and petrography to EMPA, LA-ICPMS and TEM were adopted to determine Bi content in minerals of the ore assemblage, identify Bi minerals and constrain Bi distribution to particular control mechanisms. Bismuth exists primarily as native Bi, but also occurs as chalcogenides of the tetradymite group with variable numbers of components, namely as bismuthinite, binary Se bearing and tertiary Se+S laitakarites, a quaternary Se-bearing Joseite-B mineral with varying chalcogen ratios, and other unnamed Bi-tellurides. Bismuth does not occur within the main sulphides of chalcopyrite, pyrite, pyrrhotite and sphalerite. Bismuth distribution at the Kanmantoo deposit is primarily controlled by chlorite alteration, resulting from Fe-rich fluid infiltration, shown by assaying results between the altered and unaltered lithologies along with petrographic studies. Mineralisation commences immediately post-peak metamorphism, mainly shown by enhanced garnet growth in vein selvages. Chlorite geothermometry infers the major Bi introduction into the system post-dates the main initial Cu mineralising stage, as retrograde reactivation of Fe-rich fluid at approximately 300^{o}C. Bismuth mineralisation is likely to be contemporaneous with Au, primarily shown by assaying results. The source of Bi is interpreted to be surrounding granite, or at least from a volcanic source, possibly from a crystallising magma, but the fluid itself is likely to have inputs from various different sources, highlighting current debate over the deposit type.

Keywords

Hydrothermal Systems, Bismuth Mineralisation, Distribution, Tetradymite group, Copper – Gold deposits, Ore genesis.

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