Textures and trace element chemistry of pyrite and chalcopyrite from Telfer Au-Cu deposit, W.A.: Implications for a multi-source ore system

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TEXTURAL AND LA-ICP-MS TRACE ELEMENT CHEMISTRY ANALYSIS OF PYRITE AND CHALCOPYRITE FROM TELFER AU-CU DEPOSIT, W.A.

PYRITE AND CHALCOPYRITE ANALYSIS OF THE TELFER AU-CU DEPOSIT

ABSTRACT

The Telfer Au-Cu deposit, Paterson Province, W.A. is hosted within two doubly-plunging anticlines, the Main Dome and the West Dome. The deposit consists of vertically-stacked, stratabound Au-Cu mineralised horizons (‘reefs’) linked by associated stockwork, sheeted and discordant veins. The study targeted a better petrographic, mineralogical and geochemical understanding of pyrite and chalcopyrite in E-Reefs mineralization with the objective of placing additional constraints on ore genesis. Particular emphasis is placed on Type-4 pyrite as defined by Fargher (2012), notably the speciation of mineral inclusions within this type and their significance for a genetic model involving granitoid-sourced fluids. The trace element chemistry of the associated chalcopyrite was characterised by Laser-Ablation Inductively-Coupled Plasma Mass-Spectrometry (LA-ICP-MS) to identify whether a similar signature is present.

Back-scatter electron imaging established a number of mineral associations and inclusions within pyrite and chalcopyrite. These define a pronounced Sn-Bi-Ag geochemical signature in the E-Reefs. LA-ICP-MS data for pyrite, and particularly chalcopyrite, from the E-Reefs exhibit the same Sn-Ag-Bi geochemical signature, and are indicative of a granitophile character. Such a signature is unlike that of the Middle Vale Reef.

Arsenopyrite- and gersdorffite-bearing assemblages within crosscutting veins indicate a superposed hydrothermal event, in which additional elements, like As, were introduced to the system. There is also evidence of extensive ore remobilisation as the result of a later thermal event. These findings support a modified model of ore genesis for the Telfer deposit in which not all components in the ore fluid were leached from the surrounding sedimentary rocks but also involve fluids from adjacent granites. This has application not only to the Telfer deposit but carries implications for other ore systems in the Paterson Province. Results also contribute to ongoing work ‘fingerprinting’ chalcopyrite from different ore types to establish a basis for discriminating metal sources and fluid evolution.

KEYWORDS

Telfer, Au-Cu, Pyrite, Chalcopyrite, Textures, Laser-Ablation Inductively Coupled Plasma Mass-Spectrometry, Trace Element Chemistry

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