

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

TABLE OF CONTENTS

Abstract	i
Keywords.....	i
List of Figures and Tables	2
Introduction	4
Geological Setting	7
Regional Geology.....	7
Telfer Mine Geology.....	11
Trace Element Chemistry of Pyrite and Chalcopyrite.....	12
Methods	14
Analytical Approach	14
Sampling	15
Experimental Details.....	15
Observations and Results.....	16
Mineralogy and Textures	16
LA-ICP-MS Analysis.....	26
Discussion	31
Classification of the Telfer Deposit	31
Post-genetic Overprinting	33
Towards A Broader Genetic Model	34
Implications.....	36
Conclusions	37
Acknowledgments.....	38
References.....	39
Appendix A: Methodology.....	42
Analytical Approach	42
Sampling	42
Experimental Details.....	42
SEM Analysis.....	43
LA-ICP-MS Spot Analysis.....	43
References	44

LIST OF FIGURES AND TABLES

Figure 1 (A) Geological Map of the Paterson province and locations of the Telfer Au-Cu and Nifty Cu deposits and the Kintyre U prospect, Map modified from Fargher (2012) after Bagas (2004a). (B) A schematic generalised section of the SW limb of the West Dome deposits looking WNW adapted from Fargher (2012). (C) Telfer mine geology and locations of the West- and Main-Dome, adapted from Goellnicht et al. 1989.	10
Figure 2 Oblique Schematic View of the Telfer Au-Cu Deposit looking north, showing divisions of the deposit in the Main- and West-Dome (Redrawn from Newcrest Mining 2014). The figure also shows the key mineralised zones of the E-Reefs, Middle Vale Reefs (MVR) and M-Reefs.....	12
Figure 3 Back-scatter electron images of various Cu-Bi-P mineralogy. (a) Coexisting bornite (Bn), chalcocite (Cc) and later (?) fracture-filling chalcopyrite (Ccp) within quartz (Qtz). (b) Fractured massive chalcopyrite grain, filled with bornite and quartz. The chalcopyrite appears to have two textures, a more porous (?) form makes up a large percentage of the grain, while a smooth, clear looking chalcopyrite texture lines the edges of the fracture. (c) Tetradymite (Ted) grain with nearby cubanite (Cub) vein in pyrite. (d) Fractured covellite (Cv) rim surrounding a chalcopyrite grain that is overprinted by later (?) bornite, in quartz. (e) Muscovite (Ms) filled vein with xentotime inclusions, within Massive pyrite. Bornite overprints chalcopyrite in a second vein within the pyrite. (f) Mutual boundary of pyrite and chalcopyrite. Fracture filling by anilite (Ani) coats the edges of the fracture, with quartz filling the centre. Two larger anilite grains fill voids within the chalcopyrite grain.	19
Figure 4 Back-scattered images of Cu-Sn-Zn mineralogy. (a) Quartz filling between the edges of pyrite and chalcopyrite grains. A thin rim of chalcocite (Cc) lines the edges of the massive and smaller central chalcopyrite grains. At the edge of the pyrite grain sits a chalcopyrite grain surrounded by gersdorffite (Gdf). (b) Grains of k�esterite (Kst), chalcopyrite and geerite (Gee) fill a void in massive pyrite. (c) Massive pyrite grain with inclusions of sphalerite over printed by later (?) stannite (Snt) grains. (d) Angular sphalerite (Sp) and chalcopyrite grains within massive pyrite voids. (e) Massive pyrite with sphalerite and quartz (Qtz) filled veins, with a small grain of bastn�srite-(Ce) (Bnt). (f) Massive pyrite (Py) grain with chalcopyrite (Ccp) and cassiterite (Cst) filled veins. 20	
Figure 5 Back-scattered image of As-Ag-Fe-Sn-Au-Bi mineralogy. (a) Cassiterite grains sit within massive chalcopyrite voids. (b) Arsenopyrite (Apy) lining the edge of a quartz (Qtz) vein in massive pyrite (Py). (c) Fracture filled with hematite (Hem), quartz and chalcopyrite in massive pyrite. (d) Bismuthinite (Bm) grains in massive pyrite. (e) Grains of electrum (El) within fractures in massive pyrite (py). (f) Grains of electrum within fractures and a void in pyrite. A small grain of stannite (Snt) occurs at the mutual boundary of pyrite and chalcopyrite.	22
Figure 6 Back-scatter electron images of Au-Ag-P-Sn minerals. (a) Coarse pyrite with inclusions of pyrite, stannite (Snt) and electrum. (b) Clustered pyrite grains with surrounding chalcopyrite and quartz (Qtz). Three electrum grains occur in quartz at chalcopyrite-pyrite boundaries. Cassiterite (Cst) inclusions are present within pyrite. (c) Electrum within a chalcopyrite-bearing vein in massive pyrite. A grain of native gold (Au) is observed at the boundary of the vein and pyrite. (d) Grain of electrum within chalcopyrite vein crosscutting massive pyrite. (e) Silver (Ag) grains at the edge of a	

pyrite grain surrounded by quartz. (f) Highly fractured xenotime (Xen) filled with
chalcopyrite in quartz at the edge of a massive pyrite grain. 25

Table 1 SEM-EDS analysis of Sn-, Bi-, and Au-bearing minerals 24
Table 2 Summary of minor and trace element concentration data for pyrite (ppm) 29
Table 3 Summary of minor and trace element concentration data for chalcopyrite (ppm)
..... 30