

Evidence for magmatic hydrothermal mineralisation at Kanmantoo Copper deposit, South Australia.

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ABSTRACT

The Kanmantoo Cu-Au deposit is located 55km east of Adelaide, on the eastern edge of the Mt Lofty Ranges, South Australia. It is of Delamerian age and is hosted in the Tapanappa series of the Kanmantoo Group, a pelitic turbidite sequence metamorphosed to amphibolites facies. Models for mineralisation vary from sedimentary exhalative system to epigenetic mineralisation. Despite recent work, the structural evolution of the deposit is largely unknown and this allows for the absence of a definitive model for mineralisation. Detailed face mapping of the 1190RL bench in conjunction with handheld X-Ray Fluorescence Niton gun was adopted to further investigate the relationship between key structural features and element distribution. Micro analysis by petrographic studies, Edax element maps and $\delta^{34}\text{S}$ isotope analysis was completed to gain understanding into fluid-rock relationships and origin of mineralising fluids. The findings of this study strongly suggest timing of copper mineralisation was associated with the first phase of orogenic extension at 490 ± 3 Ma. The extensional reactivation of compressional D3 shear zones, along with the injection of partially oxidised igneous derived fluids interacting with Fe-rich sediments, allows for the formation of the Kanmantoo magmatic hydrothermal deposit. Sulphur isotope results, and the mapping of magnetite-pyrite-chalcopyrite bearing K-feldspar veins are a very strong evidence of an igneous influence. Cu precipitation is as a result of a cooling oxidised magmatic hydrothermal fluids reacting with Fe in metasediments, and partially interacting with a reducing environment, rather than being directly associated with Fe rich metasomatism. Broad unmineralised zones of chlorite alteration suggest circulation of magmatic hydrothermal fluid with copper mineralisation preferentially precipitating in veins within and adjacent to reactivated D3 shears and D3 antiformal zones.

KEYWORDS

Magmatic hydrothermal, post-orogenic extension, K-feldspar veins, copper – gold.

Table of Contents

ABSTRACT.....	3
KEYWORDS.....	3
TABLE OF CONTENTS	4
LIST OF FIGURES AND TABLES.....	6
INTRODUCTION.....	9
GEOLOGICAL SETTING	11
BACKGROUND GEOLOGY	11
METAMORPHISM AT THE KANMANTOO DEPOSIT	15
MINERALISATION AT THE KANMANTOO DEPOSIT.....	16
METHODS.....	18
FIELD WORK.	18
BULK GEOCHEMISTRY	20
LOCALISED GEOCHEMISTRY	20
MICRO – ANALYSIS.....	21
THIN SECTION	21
EDAX ELEMENT MAPPING	21
SULPHUR ISOTOPE ANALYSIS (SIMS)	21
RESULTS.....	23
FACE MAPPING.....	23
PRIMARY LITHOLOGY.....	23
BEDDING	25
DUCTILE DEFORMATION.....	25
FOLDING.....	25
SHEARING.....	25
BRITTLE DEFORMATION.....	26
FAULTING.....	26
VEINS AND ASSOCIATED ALTERATIONS.	26
VEINING	26
ALTERATION	29
PETROLOGY	34
SAMPLE SI-0-5	34
.....	34
SAMPLE G2H0A.....	35
SAMPLE G3H5B.....	36

SAMPLE G2H71A	38
SULPHUR ISOTOPES	39
DISCUSSION	42
TIMING OF MINERALISATION	42
ASSOCIATED ALTERATIONS	45
SOURCE OF MINERALISING FLUIDS	46
CONCLUSION; MODEL FOR MINERALISATION	52
ACKNOWLEDGMENTS	54
REFERENCES	62
APPENDIX A: FULL METHODS	10
METHODS	10
FIELD WORK.	10
FACE MAPPING	10
VEIN PARAGENESIS AND TIMING	2
XRF NITON GEOCHEMICAL ANALYSIS	3
MICRO – ANALYSIS	5
THIN SECTION.....	5
SULPHUR ISOTOPE ANALYSIS (SIMS).....	5
APPENDIX B: XRF CALIBRATIONS	1
APPENDIX C: IOGAS TENARY PLOTS	3

LIST OF FIGURES AND TABLES

- Figure 1: Adapted from Toteff (1999) showing location of the Kanmantoo Copper mine and its relationship to the regional geology of the Kanmantoo Trough. Regional structural features such as Kanmantoo and Monarto Synclines are shown in conjunction regional major faults, lithological units and known intrusives of the region. Known mineral deposits have been indicated, along with the Tapanappa formation, which host many of these deposits..... 12
- Figure 2: Aerial photograph of the 170m 1190RL bench mapped in this study (blue), shown against the 1970's ore lode and current Spitfire pit ore lodes. Spitfire pit lodes are indicated from Hillgrove Resources modelling (2012)..... 18
- Figure 3 : Looking south towards the 170m mapped 1190RL face, showing its relationship to the current Spitfire pit..... 19
- Figure 4 : Mapped 170m of 1190 RL bench with Bulk XRF sampling of S, Fe, Al (left axis) and Cu (right Axis). Folding, faulting, veining, alteration and oxidation are overlain over stitched photographs of the mapped face, with mapping interpretation shown underneath. Bulk XRF sampled zone are shown as the average of the A and B samples. Handheld XRF results displayed are Fe, Al and S PPM (left Axis) and Cu PPM (right axis). Mineralised K-spV and SQV veining are shown to cross cut folding and also commonly cross cut foliation. Mineralised K-spV, SQV and unmineralised SV veins are all seen to be spatially related to chlorite alteration are seen in association with chlorite alteration. Fev veins are seen to cross cut all veining and fabrics. Broadly, chlorite alteration is consistent with elevated levels of S, while Cu mineralisation is locally controlled by K-spV and SQV veins and the normal fault (60-64m) and parasitic fold hinges in the vicinity of this fault. Fe distribution shows occasional increased levels around some veins and chloritised zones, however background levels are consistently between 50000-100000 ppm (5-10%) throughout both unaltered and altered zones..... 24
- Figure 5 : Stereonets of pole points (A-E) of vein lithologies and planes of all mapped veins (F). Colours are in conjunction with Table 1. A: K-spV veins with a mean orientation of 67/105. B: SQV veins with a mean orientation of 79/099. C: SV veins with a mean orientation of 84/115. D: FeV veins with a mean orientation of 83/173 E: pole points of all veins. F: Planes of all veins highlighting the rotation in stress regime from initial E dipping SQV and K-spV veins to youngest S dipping FeV veins..... 28
- Figure 6: Close space (10cm x 10cm) handheld XRF grids 1-4 shown with blank grid vs. spot sampled overlain with Cu ppm. Figure includes locations of sampled areas (grids 2 and 3) for further petrographic, Elemental and sulphur isotope analysis. Grids were selected on the basis of intensity of chlorite alteration, veining present and the presence of key structural features. Grid 1: 15-20m – Intense chlorite alteration zone in association with SV vein indicating no mineralisation present. Grid 2: 30-35m - Intense chlorite alteration with minor SV veins, no mineralisation present. Grid 3: 60-65m – K-spV and SQV veining in association with a normal fault, intense chlorite alteration and significant Cu mineralisation. Grid 4: 110-115m - Moderate chlorite alteration present across the whole grid. Moderate levels of Cu mineralisation in association with the fold hinge, but no mineralisation associated with FeV veins..... 30

Figure 7 : Ternary plots of handheld XRF data from bulk XRF GABS v BGCS v oxidised BGCS (1a, 2a, 3a) and bulk XRF GABS vs. grids 1-4 (1b, 2b, 3b). All results are in PPM scale. 1a –S:K:Al XRF GABS v BGCS v oxidised BGCS indicating chloritised samples have a consistent trend towards high S, however some unaltered, unmineralised GABS indicate moderate to high levels of S. 1b - S:K:Al XRF GABS vs. grids indicating consistent high levels of S in both mineralised and unmineralised chloritised samples from the 4 grids. 2a –Al:Fe:S XRF GABS v BGCS v oxidised BGCS indicating consistent trends in altered sample to high S, however high Fe is consistent in GABS. 2b - Al:Fe:S XRF GABS vs. Grids indicating consistent trends in altered grid samples to high S, however high Fe is consistent in GABS. Moderate levels of Al are seen in grid 4 results due to disseminated Cu sulphides. 3a - Cu:Mn:Al XRF GABS v BGCS v oxidised BGCS indicating low levels of Mn in GABS with occasional elevated levels of Mn in mineralised samples. 3b - Cu:Mn:Al XRF GABS vs. Grids indicating positive trend towards Mn when K-spV veins are present (grid 3)..... 33

Figure 8: Sample SI-0-5 from 0 metres (figure 4) displayed as ;(A) thin section in thin cross polarised light; (B) Edax combination element map; Al (light blue), Si (red), Mn (pink); (D) Fe Edax element map. Mineral codes are - Py: pyrite, Bt: biotite, Gt: garnet, Musc: muscovite, Qtz: quartz, Chl: chlorite. The sample is characterised by biotite, abundant garnet crystals and a schistose fabric. The groundmass is quartz grains with biotite. The rock fabric is formed by elongated needle-like muscovite crystals that are tightly grouped and orientated along the S2 schistosity. Minor chlorite is seen to be overprinting biotite but less aligned with the fabric. Minor pyrite is also seen to be present within the main fabric..... 34

Figure 9: Sample G2H0A from metres 28-30 (figure 4, figure7) displayed as ;(A) Edax beam image; (B) Fe Edax element map; (C) thin section in thin cross polarised light (D) Al Edax element map. Mineral codes are – And: Andalusite, Ksp: K-feldspar, St: Staurolite, Bt: biotite, Gt: garnet, Musc: muscovite, Qtz: quartz, Chl: chlorite. The sample is characterised by decussate biotite, staurolite, andalusite and garnet, with minor chlorite and quartz. Quartz inclusions are found within the andalusite grain, and staurolite is seen to post date garnet growth, as inclusions of garnet are found within the staurolite..... 35

Figure 10: Sample G3H5B from metres 60-65 (figure 4, figure7) displayed as ;(A) Edax beam image; (B) Al Edax element map; (C) thin section in thin cross polarised light ;(D) S Edax element map. Mineral codes are – And: Andalusite, Ksp: K-feldspar, St: Staurolite, Bt: biotite, Gt: garnet, Musc: muscovite, Qtz: quartz, Chl: chlorite, Py: pyrite, Cpy: chalcopyrite, Mt: magnetite. . The sample is characterised by Pyrite, magnetite and chalcopyrite in contact with biotite and andalusite (figure...). Chlorite is seen to be directly associated with chalcopyrite and replaces biotite. As chalcopyrite and chlorite infill fractures in the andalusite, it is seen to post date andalusite mineral growth. Pyrite and magnetite appear to be in equilibrium suggesting emplacement at the same time, however chalcopyrite growth along the contact of biotite and pyrite suggest the emplacement of chalcopyrite to be a later event..... 36

Figure 11: Sample G2H71A was taken from metres 30-35 (figure 4, figure7) displayed as ;(A) thin section in plane polarised light; (B); Edax combined of S (dark blue), Mg (pink), Al (light blue); (C) Edax beam image;(D) Fe Edax element map. Mineral codes are – And: Andalusite, Ksp: K-feldspar, St: Staurolite, Bt: biotite, Gt: garnet, Musc: muscovite, Qtz: quartz, Chl: chlorite, Py: pyrite, Cpy: chalcopyrite, Mt: magnetite. The sample is characterised by a strong biotite fabric, with coarse grained garnets (figure...). Chlorite is abundant and is found within garnets and is associated with biotite and sericite. Pyrite is present and is aligned along the biotite fabric. Staurolite is present and cross cuts this fabric. Edax XL-40 mapping of S, Mg and Al along with Fe shows an association between Fe rich chlorite and pyrite, as well as magnetite inclusions within the pyrite. No chalcopyrite was found within this sample.....38

Figure 12: $\delta^{34}\text{S}$ and $\delta^{33}\text{S}$ isotope ratios for four different copper bearing veins. SQV1 shows sulphur levels of 2.1‰ up to 3.85‰. SQV2 has a spread from 3.4 ‰to 5.6 ‰. K-spV1 has a spread from 3.1‰ up to 10.2‰. K-spV2 has a range from 7.89 ‰ to 8.96 ‰. STD represents standards used and calibrated against..... 40

Figure 13: Adapted from Marini et al (2011) showing Range of sulphur isotope values for sulphides from meteorites, mantle xenoliths, igneous rocks and modern sediments. $\delta^{34}\text{S}$ isotope values from Kanmantoo Cu-Au deposit and post-collisional I-type granites from Anatolia, Turkey are highlighted in red. (Data from Sasaki and Ishihara 1979; Chambers 1982; Rye et al. 1984; Sakai et al. 1984; Chaussidon et al. 1987, 1989; Ishihara and Sasaki 1989; Torssander 1989; Eldridge et al. 1991; Santosh and Masuda 1991; Salen et al 1993; Strauss 1997; Farquhar et al. 2002; Luhr and Logan 2002). The $\delta^{34}\text{S}$ value of dissolved sulphate in present-day oceans is also shown (Rees et al. 1978).....49

Figure 14: Various workers interpretations on the deformation events of the Delamerian Orogeny and Kanmantoo Trough including timing of mineralisation at the Kanmantoo Cu-Au Deposit, against this study (highlighted in red). Timing of Cu and Au mineralisation, along with mineral assemblages and alterations stated by workers have been highlighted and placed within a tectonic regime, timing of the Delamerian Orogeny and in relation to magmatism associated with the Delamerian Orogeny and estimated temperature. Data on timing of magmatic events have been gathered from Foden et al. (1999, 2002, 2006). Authors contributing to the establishment of shortening D1, D2 and D3 events, peak metamorphism and temperatures are : Offler and Fleming (1968), Mancktelow (1981, 1990), Parker (1986), Spry et al. (1988), Both (1990) and Preiss (1995). Structural investigations by Jenkins and Sandiford (1992), Flöttmann and James (1992), Flöttmann et al. (1994) and Marshak and Flöttmann (1996). Data gathered on mineralisation at the Kanmantoo Cu-Au deposit are from Seccombe (1985), Parker (1986), Oliver et al. (1998), Schiller (2000), Tedesco (2009), Wilson (2009) and Arbon (2011)..... 51

Table 1 : Vein lithology table of the 5 differing vein types mapped across the 1190RL bench.....27

Table 2: A Potts and Reddy (1999) style vein younging chart of the 5 differing vein lithologies from the mapped 1190 RL bench..... 27

Table 3: Key features of each handheld XRF grid including number, location, veining, mineralisation, alteration and any other significant features..... 31