



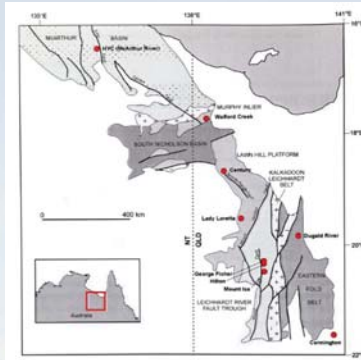
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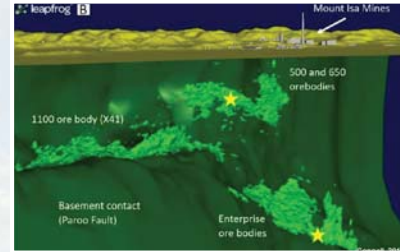
INTRODUCTION

- MIM supported honours project commenced March 2017
- Mount Isa Cu-Pb-Zn (Ag) deposit is located within the western fold belt of the Leichard-river trough of the Proterozoic Mount Isa Inlier, NW Queensland.
- Mount Isa Copper ore bodies are characterised by a relatively simple mineralogy of chalcopyrite, pyrite and pyrrhotite. However, previous work on the sulphide assemblage (Duckworth & Santaguida, 2009; Hinde, 1994; McGoldrick, 1986; Painter, 2003) identified significant accessory Ag and Co within the Mount Isa copper system.
- Past work by Duckworth (2007) looked at trace metals Co and As which this work builds on



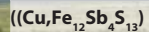
SAMPLING

- 10 thin sections were made from samples collected from the 3200 and 3500 orebodies based on their high copper grade and proximity to the edge of the orebody
- An additional 9 polished blocks were chosen from the Adelaide University historical 500 and 650 orebodies samples

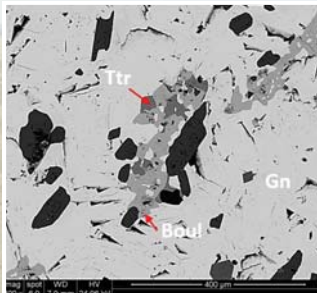


SILVER (Ag)

TETRAHEDRITE



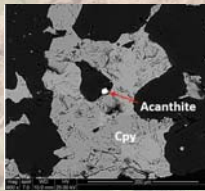
- Tetrahedrite was present within galena veins with associate mineral boulangerite ($Pb_3Sb_4S_{11}$)



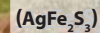
ACANTHITE



- Singular grain observed in historical sample 6085 in contact with chalcopyrite



STERNBERGITE



- Located in chalcopyrite, determined as sternbergite due to absence of Sb and As



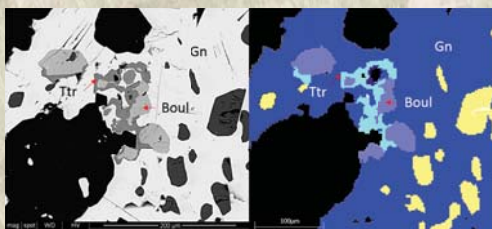
- Samples determined to be tetrahedrite based on silver content determined through LA-ICP-MS

- Chalcopyrite had up to 180ppm Ag content, indicating Ag in solid solution

- Ag in the copper orebodies demonstrates similar paragenesis and mineral relationships as the Mount Isa Pb-Zn-Ag orebody

- Based on petrological and textural observations from this study, it is proposed that cobaltite, chalcopyrite, galena, tetrahedrite and boulangerite precipitated from the same prolonged hydrothermal fluid stage.

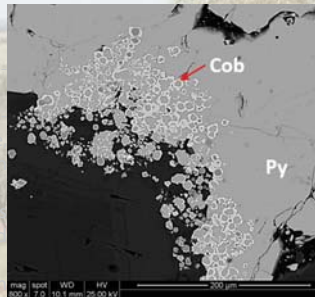
- No clear relationship between the location of acanthite and sternbergite and their abundance was found, however, both were observed in contact with chalcopyrite, indicating they may have precipitated before chalcopyrite.



COBALT (Co)

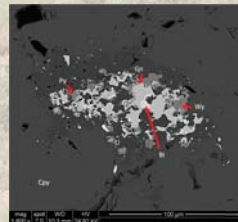
COBALTITE (CoAsS)

- Cobaltite commonly encircles pyrite, resulting in "pyritic cores"
- Cobaltite mainly as associated with pyrite, occasionally with chalcopyrite
- found in samples from 500, 650 and 3500 orebodies



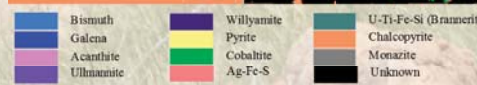
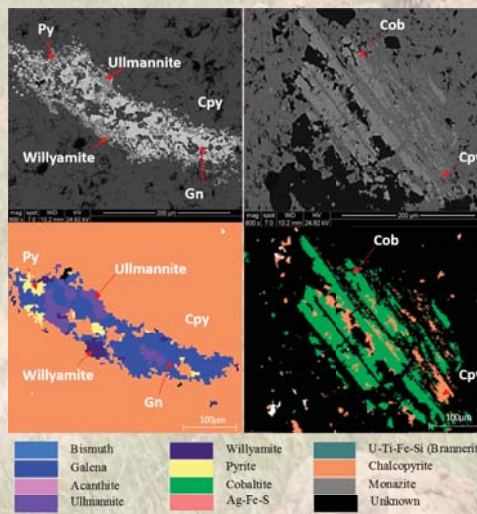
WILLYAMITE ((Co,Ni)SbS)

- Previously has only been identified in Broken Hill, NSW
- Cobalt absent (NiSbS) Also present
- Presence of these minerals indicate the existence of Sb and Ni in the system



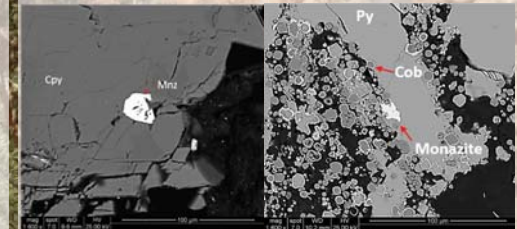
- Based on results from this study, it appears cobaltite was deposited before economic sulphides (chalcopyrite).

- Co concentration within the copper orebodies ranges from 31.82% (Croxford 1975) to 33.6%



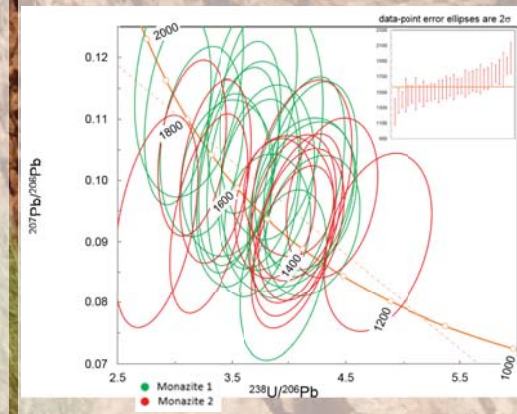
MONAZITE

- Monazite was present in 55% of samples
- Monazites have been located in all orebodies sampled (+ 1100 orebody)
- 26 monazite grains ranging from 2-50 microns
- no apparent consistent distribution throughout the orebodies



GEOCHRONOLOGY

- sampled monazite was from the 1100 orebody, surrounded by brecciated siliceous shale
- analyses were done on 2 grains, with 32 spots done, therefore the data from these results are limited
- combined U^{207}/Pb^{206} age for 2 grains was $1614 \pm 52 Ma$
- monazite a: $1638 \pm 95 Ma$
- monazite b: $1535 \pm 61 Ma$
- Petrographic interpretations indicate that monazite was placed before both carbonates events at Mount Isa
- It is proposed by this study that monazite was either (a) syngenetically deposited with pyrite 1, or (b) were part of a discrete hydrothermal fluid stage around pyrite 1 deposition not been previously identified.



SUMMARY

- Cobalt is hosted by the minerals cobaltite and willyamite
- Silver is hosted by a variety of minerals including tetrahedrite, acanthite, sternbergite and in solid solution in chalcopyrite (up to 3.9%)
- The distribution of trace minerals is not consistent throughout the copper orebodies, consistent with a prolonged and complex hydrothermal system
- Monazite dates correlate with several dates of significance in the Mount Isa copper deposit
- Through the use of current mine processes and new extraction techniques, these trace metals may be able to be economically extracted