

## **Controls on ultra-high-grade gold vein in orogenic-gold deposit, learnings from the Callie deposit**

LAURA PETRELLA<sup>1</sup>, NICOLAS THÉBAUD<sup>1</sup>, CRYSTAL LAFLAMME<sup>2</sup>

<sup>1</sup> Centre for Exploration Targeting, University of Western Australia, Crawley WA, Australia

<sup>2</sup> Département de géologie et génie géologique, Université Laval, Québec, Canada

Orogenic gold deposits are producing the majority of the gold mined worldwide, locally from ultra-high-grade (>100g/t) ore shoots where mineralization occurs as visible gold in quartz veins. In these veins, the extreme gold concentration appears to exceed the Au solubility expected for fluids at thermodynamic condition typical for ore formation [1]. Gold transport as colloids in suspension in the ore fluid [2] was proposed as an alternative transport mechanism to explain the discrepancies observed between gold grade and solubility of Au(I)-hydrogen-sulfide complexes. Although predicted, the contribution of gold colloids to orogenic fluid solution has never been demonstrated. In this study we investigate the ultra-high-grade (up to 10,550 ppm Au) gold veins from the world-class Callie gold deposit (14 Moz Au) situated in Northern Territory, Australia. High-grade mineralization is hosted in decarbonized siltstones and contained within narrow (2 cm thick), non-laminated, shear extensional quartz veins. Structural and petrographic observations suggest that the ore formed at ca. 1805 Ma, as a result of one mineralizing event, and that later gold remobilization did not play a significant role in the formation of the ultra-high-grade veins [3]. We think that colloidal gold transport might explain the extremely high gold concentration observed in the Callie quartz veins and we are investigating the possible preservation of colloidal gold and silica gel textures using Transmission Electron Microscopy analysis.

### References

[1] Pokrovski, G. S., Akinfiev, N. N., Borisova, A. Y., Zotov, A. V. & Kouzmanov, K. Gold speciation and transport in geological fluids: insights from experiments and physical-chemical modelling. *Geol Soc Spec Publ* 402, 9-70,

[2] Herrington RJ, Wilkinson JJ (1993) Colloidal Gold and Silica in Mesothermal Vein Systems *Geology*

[3] Petrella L et al. (Accepted) Contemporaneous formation of vein-hosted and stratabound gold mineralization at the world-class Dead Bullock Soak Mining Camp, Australia