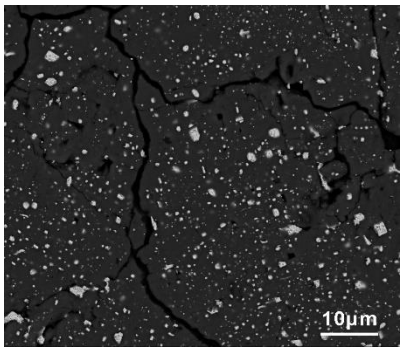
Paper Number: 1365

Nano- to micron-particulate gold hosted by magnetite from the Beiya gold deposit, SW China

Zhou, H.Y.[1], Sun, X.M.[1,2,3]*, Lin, H.[2], and Yu F.[2]

[1]School of Earth Science and Geological Engineering, Sun Yat-sen University, Guangzhou 510006, China
[2]School of Marine Sciences, Sun Yat-sen University, Guangzhou 510006, China
[3] Key Laboratory of Marine Resources and Coastal Engineering in Guangdong Province, Guangzhou 510006, China
*Corresponding author, email: eessxm@mail.sysu.edu.cn

In many hydrothermal deposits, gold always occurs as mineral inclusions and invisible gold hosted by sulphide minerals, such as pyrite and arsenopyrite [1][2]. This is due to gold's affinity for reduced sulphur [3]. Although oxide minerals such as magnetite have been proposed as important gold host minerals [4], the occurrence and mechanisms of gold incorporation within magnetite are poorly constrained. The Beiya gold deposit, located in the southeast Tibetan Plateau, to the east of Jinshajiang-Red River fault zone, is one of the largest gold deposits in China. The deposit is regard as a porphyry-skarn system and is related to a porphyritic alkaline and potassic quartz syenite with zircon U-Pb ages of ~35 Ma [5]. It contains a sizable resource of 125.6 Mt @ 2.42 g/t Au, 169.6 Mt @ 42.56 g /t Ag, 138 Mt @ 33.34 % Fe, 122.9 Mt @ 0.48 % Cu, 131.5 Mt @ 1.84 % Pb, and 145.7 Mt @ 0.35 % Zn [6]. The dominant gold orebodies are skarn-style and are composed of amounts of massive magnetite ores. Here, we demonstrate that abundant nano- to micron-sized gold inclusions are hosted by magnetite from massive magnetite ores in Beiya (Fig. 1). These gold inclusions are present as native gold and electrum 10 nm to 10 μm in size. They occur in magnetite as randomly disseminated blebs or concentrated in dense patches. Native bismuth was observed within the same assemblage and there is an immediate association between native bismuth and gold.



Native bismuth, when molten is an efficient gold scavenger proven experimentally [7]. Previous study [5] indicated that the prevailing temperatures of magnetite growth in Beiya exceeded the melt point of native bismuth (271°C). Therefore, we propose that abundant Bi-melts occurred during magnetite growth and subsequently scavenged gold from the hydrothermal fluids, which is one of the significant mechanisms resulting in enormous Au-enrichment at Beiya. This study also indicates that magnetite-rich systems are also potential targets for Au exploration and extraction.

Figure 1: Back-scattered electron image of abundant nano- to micron-sized gold (light) within magnetite (dark)

References:

[1] Schwartz G M (1944) Econ Geol 39: 371-411
[2] Cook N J and Chryssoulis S L (1990) Can Mineral 28: 1-6
[3] Pokrovski G S et al. (2014) Geological Society of London Special Publication 402: 9-70

[4] Larocque A C L et al. (2002) Econ Geol 97: 159-164
[5] He W Y et al. (2015) Econ Geol 110: 1625-1641
[6] Li W C et al. (2016) Ore Geol Rev 73:n241-252
[7] Tooth B et al. (2008) Geology 36: 815-818