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**Textures and in-situ chemical and isotopic analyses of pyrite, Huijiabao Trend, Youjiang Basin, China: Implications for paragenesis and source of S**

Hou, L.<sup>1</sup>, Armstrong, R.<sup>2</sup>, Peng, H.J.<sup>3</sup>, Ding, J.<sup>1</sup>, Zhang, J.R.<sup>1</sup>, Zhu, S.B.<sup>1</sup>, Wu, S.Y.<sup>1</sup>

<sup>1</sup>Chengdu Center, China Geological Survey, Chengdu 610081, China, houlin\_aaron@163.com

<sup>2</sup>The Australian National University, Canberra, Australia

<sup>3</sup>Economic Geology Research Centre (EGRU), College of Science, Technology and Engineering, James Cook University, Townsville, QLD 4811, Australia

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Many Carlin-like Au deposits occur within the Youjiang Basin of SW China. The Huijiabao Trend in Guizhou Province contains over 300 tons (10.6 Moz) of Au at an average grade of 7–18 g/t. Petrographic and SEM studies of pyrite led to the recognition of four stages of pyrite. Py1 consists of fine-grained framboidal crystals in black mudstone. Py2 is comprised of coarser grained euhedral–subhedral clusters. Py3 is coarse grained, euhedral, and occurs as overgrowths on Py1 and Py2. Py4 generally occurs as rims on Py1–Py3 and is intergrown with arsenopyrite.

Sensitive high resolution ion microprobe (SHRIMP) <sup>34</sup>S analyses of each pyrite type and arsenopyrite show that Py1 is related to Py2 and that Py3 is related to Py4 and arsenopyrite. The S isotope compositions of Py1 and Py2 are bimodal, which suggests that H<sub>2</sub>S was generated by biogenic sulphate reduction in open marine and sulfate limited systems during sedimentation and/or diagenesis. The compositions of Py3, Py4, and arsenopyrite have an intermediate range of values near 0‰ that suggest that H<sub>2</sub>S was derived either from average pyrite in sedimentary rocks or from a concealed magmatic source. Laser ablation–inductively coupled plasma–mass spectrometer (LA–ICP–MS) trace element analyses (As, Ni, Co, Cu, Ag, Se, V) support different origins and show that Py3 and Py4 are ore related. The lower w(Co)/w(Ni) and w(S)/w(Se) ratios of Py1 and Py2 are consistent with formation during sedimentation or diagenesis, whereas the higher ratios of Py3, Py4, and arsenopyrite are consistent with a hydrothermal origin. The different concentrations of Au in Py1, Py2 and Py3, Py4 indicate that little Au was added during sedimentation or diagenesis, and most of the Au was introduced during subsequent hydrothermal fluid flow.

Published isochron ages on arsenopyrite (Re–Os ~200 Ma) and late calcite–realgar veinlets (Sm–Nd ~135 Ma) in the Huijiabao trend are older than mafic dikes (84 Ma) exposed ~20 km to the east. If the 200 and 135 Ma ages are valid, H<sub>2</sub>S and Au may be derived from a sedimentary source because igneous intrusions of this age have not been found. If these ages are not valid and the gold deposits are actually late Cretaceous in age, then H<sub>2</sub>S and Au may be derived from a magmatic source. Additional geochronology and isotopic tracer studies are needed to resolve this uncertainty.

*References:*

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