Characteristics and origin of the Lala iron oxide Cu-Co-(U, REE) deposit: Sichuan, Southern China

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Cu-Co-REE-U mineralization at the Lala mine is multistage, controlled by the geologic-tectonic evolution of the region. The deposit has been interpreted as volcanic-hosted massive sulfide [1], metavolcanic-sedimentary with hydrothermal remobilization [2], or IOCG-type mineralization [3, 4]. The ore deposit is hosted by a Middle Proterozoic volcano-sedimentary succession, metamorphosed at upper-greenschist to amphibolite-facies conditions, early during the Sibao Orogeny (~1 Ga). Mineralization occurred during the Neoproterozoic at ca. 830 Ma [5].

The host rocks are metamorphosed and hydrothermally altered intermediate to mafic volcanics and mica schist. The main alteration styles include albitization and sericitization. Textural evidence allows recognition of 3 modes of sulphide mineralization with a distinct sequence of formation, indicating a complex and multiphase genetic evolution. There are strong indications that the mineralization is essentially epigenetic-hydrothermal in origin and the formation of hydrothermal breccias may be attributed to fluid release from an underlying magma. While there is no strict statistical correlation between La and Cu, Cu-rich samples are always enriched in REE elements. Other characteristic features include the abundance of iron-oxides and Cu-sulfides, a low-Ti magnetite chemistry, REE-mineralogy, and the presence of uraninite.

These new data lend evidence to the conclusion that, in contrast to previously proposed ore genesis models, the mineralization at Lala possesses many features that warrant its inclusion within the global IOCG deposit class.