The Biological and Reworking Metallogenic Models of the Lanmuchang TI Deposit*

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**Geological Characteristics of the TI Deposit:** The TI deposit is located in the Southwest Guizhou depression zone, belonging to the platform sedimentary area, on the southwestern margin of the Yangtze Pereplatform and closely adjacent to the northwestern margin of the South China Folded Belt. Orebodies occur chiefly in the Upper Permian Longtan Formation and Changxing Formation strata. Quite a large number of micro-plaeoorganism fossils, especially foraminifera and bryozoa, can be seen in TI ores formed by way of bio-enrichment during sedimentary diagenesis. Most of them have been replaced by TI-bearing ore fluid, forming TI minerals that have preserved bio-psuedomorphs, for example lorandite and christite. Analysis of the time limitation of biological community and bio-enrichment metallogenetetic mechanism indicates that the bio-enrichment metallogenic stage appeared in Late Permian, i.e., Late Hercynian. The ore-bearing layers are as many as fourteen in number. The main ore-bearing rocks are a hydrid sedimentary complex, i.e., composed of several lithologies[1]. The lithofacies transformation belt is the location where the hybrid is located, and it is also the favorable locus of metallogenesis.

**Metallogenic Models of the TI Deposit:** The metallogenic models of the TI deposit can be roughly divided into two models: bio-enrichment metallogenesis and hydrothermal reworking metallogenesis. The former is contemporaneous or slightly later than the Late Permian sedimentary diagenesis, belonging to the Hercynian metallogenesis while the latter occurred in the Middle Triassic, corresponding to the Indosinian metallogenesis. At the bio-enrichment metallogenic stage abundant bio-fossils, especially micro-paleoorganism fossils, were replace by TI-bearing ore-forming hydrothermal solutions(TI, As, S, etc.), forming TI minerals with bio-pseudomorphs, especially those with foraminiferal pseudomorphs, which are indicative of the bio-enrichment metallogenic stage. TI minerals crystallized during this metallogenic stage (e.g. lorandite) display, without exception, bio-pseudomorphs, and are very fine in grain size, mostly measuring around less than 1 mm. They are distributed in disseminated, colloidal and micro-paleoorganic forms in the ore-bearing layers. The grade of TI ores depends on the abundance of micro-paleoorganisms, both showing a positive correlation. Bio-enriched TI-bearing orebodies still maintain the stratigraphic attitude and lithological character at the time of sedimentation, but micro-paleoorganism fossils in the ore-bearing layers have been completely replaced by TI minerals. At this stage the TI-bearing orebodies were almost destroyed by later hydrothermal reworking processes with little rellic.[2]

At the hydrothermal reworking metallogenic stage, owing to hydrothermal reworking and superimposition, the picture at the bio-enrichment metallogenic stage was almost completely changed. No significant difference is found in ore texture and occurrence from the ordinary metallic(Hg, Sb, Pb, Zn, etc.) ore deposits. Minerals, especially TI minerals, crystallized at this stage are precisely different from those formed during the bio-enrichment metallogenic stage, which are characterized as being large in grain size (>1mm), some individual crystals even as large as to be up to 5-10mm. The minerals are diverse in form, for instance the massive, radiated and tabular crystals. TI orebodies are also diverse in form, including stratiform, lenticular and enveloped orebodies. No bio-fossils and TI minerals with bio-pseudomorphs have been observed in the TI orebodies and ores, indicating that they are typical hydrothermal minerals.[3]

**References:**