The Lanzhichang deposit: A low-Ti iron oxide deposit related to low-Ti basalts in the Emeishan large igneous province, SW China

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The Late Middle Permian (~260 Ma) Emeishan large igneous province (ELIP) in SW China contains two magma types: a low-Ti (LT) type and a high-Ti (HT) type. The HT basalts and the related intrusions are associated with giant Fe-Ti-V oxide deposits, however the LT basalts and the related intrusions are associated with Ni-Cu-(PGE) sulfide deposits. However, there are still some low-Ti iron oxide deposits distributed in the Yanyuan region in the Emeishan large igneous province. Compared to the massive researches on the Fe-Ti-V oxide deposits and the Ni-Cu-(PGE) sulfide deposits in the ELIP, these low-Ti iron oxide deposits are normally ignored. These deposits contain minor TiO$_2$ and V$_2$O$_3$. The magnetite of these deposits contains average TiO$_2$ of 0.002% and V$_2$O$_3$ of 0.027% (by EMPA). And there is no ilmenite found as independent minerals or the solid solution in the magnetite of the iron ores. This is very different from the high TiO$_2$ and V$_2$O$_3$ content in the magnetite of the Fe-Ti-V oxide deposits in the ELIP, such as the Taihe deposit of which the magnetite contains TiO$_2$ of 5.326% and V$_2$O$_3$ of 0.749%. In the Taihe deposit there is abundant ilmenite distributed in the magnetite as solid solutions or exit as separate minerals.

The Lanzhichang deposit, which was found in 2005, is a representative low-Ti iron oxide deposit in the Yanyuan region and is the first volcanic deposition type deposit found in the ELIP. It is hosted in the lower section of the Emeishan basalts and the iron orebodies are found interbedded with the basalts conformably. The basalts as the wall rock are belong to low-Ti basalts, which exhibit chemical compositions of TiO$_2$ <2.5% and Ti/Y < 500. The deposit is composed of single to multi layers of iron orebodies; and usually the overlying strata of the orebodies are the basaltic breccia, and the footwall rocks are the compact basalts. The boundary between orebodies and country rocks is clear and the wall rock alteration is not developed. Corresponding to the layered orebodies, most iron ores have a laminated structure. In some lamellar iron ores, the magnetite layer is interbedded with the basaltic tuff, and the majority of the magnetite has alteration of the hematite. The relatively high grade of the Fe ores consist of abundant magnetite and some clastic volcanic rocks, but the laminated structure is still clear. All the magnetite is fine-grained (<0.1 mm). The other metallic minerals include fine-grained pyrite with frambooidal texture, hematite, and chalcopyrite. The nonmetallic minerals consist of chlorite, quartz, feldspar, and calcite, which were generated from the original volcanic rocks and the late hydrothermal alteration. All these specific ore structures indicate a volcanic sedimentary genesis. Therefore the Lanzhichang deposit is a low-Ti iron oxide deposit related to the low-Ti basalts in the ELIP.