Origin of magmatic Fe-Ti-V oxide deposits in the layered intrusions of the Emeishan LIP (SW China): constraints from microstructures and melt inclusions

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Layered mafic-ultramafic intrusions in the Panxi region, SW China, such as the Panzhihua, Hongge, Xinjie and Baima intrusions, are parts of the ~260 Ma Emeishan large igneous province (LIP). These layered intrusions are volumetrically small relative to the world-known layered intrusions such as the Bushveld Complex in South Africa. However, a distinct feature of the intrusions in the Panxi region is that large volumes of Fe-Ti oxide ores occur in the middle to lower parts of the intrusions.

The Panzhihua intrusion is mainly composed of melagabbro and lecuogabbro and can be divided into the marginal zone (MGZ), lower zone (LZ), middle zone (MZ), and upper zone (UZ). The LZ and MZa is mainly composed of melagabbro and host major ore bodies whereas the MZb and UZ is mainly composed of lecuogabbro and rich in apatite.

we identify the melt inclusions in the apatite with highly variable compositions in MZb and reactive microstructure in LZ of the intrusion. The compositions of the melt inclusions range from very Si-poor (10.0 wt.% SiO_2 and 48.8 wt.% FeO) to very Si-rich (76.5 wt.% SiO_2 and 0.73 wt.% FeO). Replacive symplectites of Cpx+An-rich Pl and Fe-Ti oxides +Amp±Cpx in the interstitial phases of the ores indicate a high temperature immiscibility and disclose the upward migration of interstitial immiscible Si-rich melt. The wide composition range of melt inclusions in the apatite is attributed to the coexistence of *in situ* melts and immiscible Si-rich melts migrated from different layer position. The downward migration of Fe-rich melt form a Fe-rich melt pool at the base of the intrusion. In this Scenario, large amount of magnetite crystallized from the Fe-rich melt to form massive ores containing embayed silicates. This study highlights that large-scale migration of immiscible Si-rich liquids may play a significant role in the petrogenesis and metallogenesis of the Panzhihua intrusion.

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