

## **Origin of giant Fe-Ti-V oxide deposits hosted in layered intrusions of the Emeishan large igneous province, SW China**

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Layered mafic-ultramafic intrusions in the Panxi region, SW China, such as the Panzihua, Hongge, Xinjie and Baima, are part of the ~260 Ma Emeishan large igneous province (LIP). These layered intrusions are volumetrically small relative to other famous 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 Panzihua intrusion is mainly composed of melagabbro and lecuogabbro and can be divided into a marginal zone (MGZ), lower zone (LZ), middle zone (MZ), and upper zone (UZ). The LZ and MZ are mainly composed of melagabbro and host major ore bodies whereas the MZb and UZ are mainly composed of lecuogabbro and are rich in apatite.

Melt inclusions in apatite have highly variable compositions in the MZb and reactive microstructure in the LZ of the intrusion. The compositions of the melt inclusions range from very Si-poor (10.0 wt.% SiO<sub>2</sub> and 48.8 wt.% FeO) to very Si-rich (76.5 wt.% SiO<sub>2</sub> 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 high temperature immiscibility and suggest 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 that migrated upward from underlying layers. The downward migration of Fe-rich melt formed 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 Panzihua intrusion.