Liquid immiscibility in the Panzhihua mafic intrusion hosting giant Fe-Ti oxide deposit in the Emeishan large igneous province (ELIP), SW China

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Silicate melt immiscibility is one of the basic method of magma evolution and has been widely reported in various type of rocks[1, 2, 3, 4]. The opposing trends of immiscibille melts are fascinating and may be a potential ore forming factor, however, its role is deemd to be minor in petrogenesis and ore genesis[5]. In this contribution, we identify melt inclusions with highly variable compositions and Fe-rich reactive microstructure, which reflects immiscibility, in the Panzhihua intrusion, ELIP. The compositions of melt inclusions recorded in apatite of the middle zone b range from very Si-poor (17.7 wt.% SiO_2, 40.2 wt.% FeO) to very Si-rich (76.5 wt.% SiO_2, 0.73 wt.% FeO). Fe-rich replacive microstructures in the lower zone indicate a high temperature immiscibility and disclose the upward migration of interstitial immiscible Si-rich melt. The wide composition range of melt inclusions in apatite is attributed to the coexistence of in situ melts and immiscible Si-rich melts migrated from different layer positions. The downward migration of network Fe-rich melt forms a Fe-rich melt pool at the base of the intrusion. In this Scenario, large amount of magnetites crystallized from the Fe-rich melt to form massive ores containing embayed silicates. This study highlights that large-scale separation of immiscible liquids may play a significant role in the petrogenesis and metallogenesis of the Panzhihua intrusion.

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