Ilmenite-series granitoids of the Peninsular Ranges batholith of southern and Baja California and the inner zone batholith of southwestern Japan

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Belts of juxtaposed oxidized and reduced granitoids in continental margin batholiths around the circum-Pacific have been characterized primarily by striking differences in magnetic susceptibility. Oxidized belts display high magnetic susceptibility, which is proportional to magnetite content. The reduced rocks tend to be magnetite-poor and lack Fe-oxide minerals in general. Fundamentally, Fe-oxide mineralogy and abundance is a function of oxygen fugacity. The oxidized belts were termed “magnetite-series” and the reduced belts were termed “ilmenite-series” by Dr. Shunso Ishihara. The best examples of this juxtaposition are in the Peninsular Ranges batholith (PRB) of southern and Baja California as well as the inner zone batholith of southwestern Japan, in which 100s of km-long boundaries between magnetite-series and ilmenite-series granitoids exist. Specifically, the well-studied ilmenite-series granitoids of the Ryoke and San’yo belts of Japan act as comparisons to better understand the petrogenesis of the ilmenite-series La Posta belt of the PRB. Hornblende-biotite monzogranite of the San’yo belt were collected from quarries in Okayama prefecture. The Ushigaura tonalite and Ushigaura granite were sampled from exposures of the Ryoke belt on Shōdoshima Island. The Sierra San Pedro Martí r and Laguna Juarez plutons of the La Posta belt were sampled by previous researchers from San Diego State University. Both plutons are zoned from hornblende-biotite tonalite in the rim, to a zone of hornblende-biotite granodiorite, and to a two mica monzogranite in the core. Plutons of the La Posta belt commonly include titanite, unlike the San’yo and Ryoke belts, which may indicate relative differences in oxygen fugacity. Biotite and amphibole compositions, which are sensitive to pressure, temperature, water fugacity and oxygen fugacity, may provide more information about the conditions that ilmenite-series plutons cool under. Characterization of biotite and amphibole are a first step towards more detailed Tl isotope analyses as well as Fe3+/(Fe2++Fe3+) quantification.

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