

Rifting-related, Permian ferrosyenites in the Panxi region of the Emeishan large Igneous province, SW China

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Ferrosyenite is a rare olivine bearing syenitic plutonic rock usually hosted in Precambrian extensional and post orogenic environments. Within the Panxi rift of the Permian Emeishan large igneous province (ELIP), SW China, a 20 km² ferrosyenitic pluton intrudes the 260 Ma Baima igneous complex (BIC). The BIC is a composite mafic-felsic intrusion and hosts a giant Fe-Ti-V oxide deposit. The ferrosyenite is dated using SHRIMP zircon U-Pb techniques at 252 ± 2.5 Ma and is thus one of the few Phanerozoic examples of ferrosyenites. The Panxi ferrosyenite is mainly composed of perthitic feldspar, olivine, quartz, clinopyroxene and Fe-Ti oxides and contains 61.8-63.7 wt. % SiO₂, 5.0-7.3 wt. % Fe₂O₃ and 9.9-12.1 wt.% total alkalis. The ferrosyenite displays positive Eu anomalies ($Eu/Eu^* = 0.9-2.1$) and is enriched in LREE [$(La/Sm)_N = 2.6-2.9$]. The ϵ_{Nd} values and $(^{87}Sr/^{86}Sr)_{initial}$ ratios of the ferrosyenite range from +1.3 to +1.9 and from 0.7039 to 0.7064, respectively, which overlap with the BIC. The geochemical data suggest that both the ferrosyenite and the BIC had the same mantle source. The 8 Ma age gap between the two intrusions, however, suggests that the ferrosyenite was produced only after the original BIC magma was extracted from the source. The ages of the ferrosyenite and BIC are coincident with two Permian mass extinction events which suggest the ELIP may have been a causing factor to both.