

The Permian-Triassic granitoids in Bayan Obo, China: a geochemical and geochronological study

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Granitoids near the giant Bayan Obo REE deposit at the north margin of the North China Craton, the world's largest LREE deposit, have been taken by some authors as the key factors that controlled the mineralization. In contrast, others proposed that the REE deposit has been partially destructed by these granitoids. Here we report systematic studies on geochronology and geochemical characteristics of granitoids of different distance from the orebodies, to investigate the genesis and their relationship to the giant Bayan Obo deposit. Granitoids studied here, including granites and quartz monzonites, are peraluminous, LREE enriched and HREE depleted, with variable REE concentrations (total REE = 54-330 ppm) and large negative Eu anomaly ($\delta\text{Eu} = 0.19-0.70$). The REE patterns are distinct from those of ore-bearing dolomites. Some samples have slightly higher LREE concentrations, which may have been contaminated by the orebodies during intrusion. The granitoids plot within the post-collision granite field in the Pearce diagram, which is consistent with the tectonic regime. The quartz monzonites and one granite have A-type granite characteristics and belong to A₂ subgroup. High precision U-Pb dating for the zircons yield $^{206}\text{Pb}/^{238}\text{U}$ ages ranging from 243.2-293.8 Ma. The formation of the granitoids is >55 Ma later than the latest ore forming age. The Ti-in-zircon temperature of the granitoids ranges from 590 to 770 °C. All these evidences suggest that the granitoids have no contribution to the formation of the Bayan Obo deposit. Granitoids that are close to the orebodies had limited interaction with it and gained some LREE-enriched characteristics during magmatisms. Nevertheless, their effects to the orebodies are subtle. All the granitoids formed in a post-collisional tectonic regime at convergent margins, which is consistent with plate subduction during the closure of the Palaeo-Asian Ocean, started in the Neoproterozoic and lasted until the Carboniferous/Permian.