



## **Timing of the final closure of the Paleo-Asian Ocean in the Alxa Terrane: Constraints from geochronology and geochemistry of Late Carboniferous to Permian gabbros and diorites**

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The Alxa Terrane is a crucial place situated between the North China Craton to the east and the Tarim Craton to the west. The Late Paleozoic magmatic record in the Alxa Terrane places important constraints on the timing of the final closure of the middle segment of the Paleo-Asian Ocean (PAO). In this study, new LA-ICPMS zircon U-Pb dating results reveal ca. 300-268 Ma gabbros and diorites in the Bayan Nuru area in the eastern part of the Alxa Terrane. The ~300 Ma gabbros show plagioclase accumulations with anorthite compositions (An<sub>92-95</sub>), arc-like geochemical affinities with relative enrichment in large ionic lithophile elements and depletion in high field strength elements (e.g., Ti, Nb and Ta), as well as negative  $[\text{U}+\text{F}065]\text{Hf}(t)$  (-6.01 to -1.75) and  $[\text{U}+\text{F}065]\text{Nd}(t)$  (-9.5 to -7.1) values and high initial  $87\text{Sr}/86\text{Sr}$  ratios (0.707157-0.707220). These features indicate a magma source of an enriched lithospheric mantle metasomatized by high fluid activities. In comparison, the 280-268 Ma gabbros and diorites also have arc-like geochemical affinities but show increasingly evolved isotope compositions, implying more sediment inputs. Compiled zircon  $\varepsilon\text{Hf}(t)$  and whole-rock  $\varepsilon\text{Nd}(t)$  values of the magmatic rocks in the Alxa Terrane decrease from the Late Carboniferous to the Early Permian, and increase from the Middle Permian to the Triassic. The considerably large spread in  $\varepsilon\text{Hf}(t)$  and  $\varepsilon\text{Nd}(t)$  values at ca. 280-265 Ma likely reflects a tectonic switch from a subduction setting to a post-collisional setting, corresponding to the timing of the final closure of the PAO in the Alxa Terrane. Thus, the PAO progressively closed from west to east along the northern margin of the Tarim Craton, the Alxa Terrane, and then the northern margin of the North China Craton during Late Carboniferous to Middle Triassic time.

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