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Tectonic setting and geochronology of Paleo-Asian Baijiantan Ophiolite in West Junggar, NW China

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The Central Asian Orogenic Belt (CAOB), is the largest proliferative orogenic belt in the Phanerozoic, located between Siberia and the Tarim north China plate. Its tectonic evolution is closely related to the evolution of the ancient Asian Ocean. The CAOB has an intimate connection with the evolution of the Paleo-Asian Ocean (PAO) which experienced geodynamic processes like seamounts accretion, ridge-trench interaction, the constitution of back-arc basins. Since the Paleozoic era, the PAO has undergone expansion, subduction and closure, and finally formed the current Central Asian orogenic belt. The West Junggar, located in the southwest of the Central Asian orogenic belt, is an accretive Mosaic body on the southern edge of the Siberian Craton. It is an important part of the Palaeozoic orogenic collage of the CAOB, and a composite terrane composed of island arcs, ophiolites, seamounts and a key area for the study of the tectonic evolution of the Central Asian orogenic belt during the Paleozoic era. The ophiolite mélangé zone in Karamay and the carboniferous siliceous calcite with great thickness jointly indicate the existence of the late Paleozoic residual ocean basin in Junggar area. This paper presents new zircon geochronology and whole rock major and element, and Sr-Nd isotope data for mafic rocks in the Baijiantan ophiolitic mélanges.

The studying area is located in the northeast part of Karamay city, In the substratum of metamorphic peridotite serpentine, the pyroxenite, gabbro, jasper and radiolarite blocks of different sizes are distributed, and the edge of the blocks is fragmented and in contact with the matrix structure. The Baijiantan ophiolitic mélangé is covered by a set of late Carboniferous volcanic-sedimentary tectonic unconformities .

The magmatic zircons from an anorthosite in Baijiantan ophiolite yield concordia U-Pb isotope age of 370.1 ± 1.2 Ma, which is interpreted as the crystallization age of the anorthosite. The mafic rocks of Baijiantan ophiolite are geochemically belong to tholeiitic basalts with low SiO₂ contents as well as relatively depleted in light rare earth element (LREE) and flat in heavy rare earth element (HREE), while the high-field strength elements (Nb and Ta) display a weak depletion. thus they have a N-MORB-type characteristics. which is similar to those of basalts from back-arc basin. The (⁸⁷Sr/⁸⁶Sr)_i of Baijiantan ophiolite range from 0.704567 to 0.705172, and they have positive ε_{Nd}(t) with from +8.23 to +8.81, indicating they were derived from a depleted MORB-type mantle source.

To sum up, the Baijiantan ophiolite in the western Junggar was formed in the late Devonian. The mafic rocks are characterized by MORB type of basaltic magma. Their Sr-Nd isotopic compositions indicate they were derived from a depleted asthenospheric mantle, all of these features are similar to the back-arc basin basalts. Thus, we suggest the Baijiantan ophiolite was possibly formed in the back arc oceanic basin in the late Devonian.

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