

Sr-Nd isotopic compositions of the San-yo Belt, Southwest Japan: Implications for the Cretaceous enriched mantle

*Shogo Kodama¹, Masaaki Owada¹, Teruyoshi Imaoka¹, Atsushi Kamei²

1. Yamaguchi University, 2. Shimane University

Cretaceous to Paleogene igneous rocks are widely exposed in the Inner Zone of Southwest Japan where the granitic rocks have been divided into the San-in, San-yo, and Ryoke Belts on the basis of their lithologies, geochemical compositions, magnetic susceptibility and associated ore deposits (Ishihara, 1971). The San-yo and Ryoke Belts belong to the ilmenite-series granitic rocks, but the San-in Belt corresponds to the magnetite-series ones (Ishihara, 1977). According to Sr isotopic compositions, Kagami et al. (1992) classified these granitic rocks into the North Zone, South Zone, and Transitional Zone situated between the North and South Zones. The granitic rocks from the Transitional and South Zones show negative ϵ_{Nd} values (Kagami et al., 1992); however, the isotopic compositions of granitic rocks would serve only as proof for the bulk of the continental crust (Jahn, 2010). This means that those data are unlikely to provide us with mantle signatures. Imaoka et al. (2014) described the Early Cretaceous lamprophyre (c. 105 Ma) from the Kyoto district. The Kyoto lamprophyres geochemically show enriched signatures with positive and negative ϵ_{Nd} values corrected to 105 Ma. In consideration of the geochemical signatures and tectonic setting, Imaoka et al. (2014) concluded that the Kyoto lamprophyre was derived from heterogeneous enriched mantle created by the subduction of the oceanic crust. Aspects of the existence of enriched mantle, however, are still unclear, such as in regard to its regional extension and duration for the Cretaceous magma activities of the Inner Zone of Southwest Japan.

Late Cretaceous igneous rocks are widely exposed in the western part of Honshu Island. These igneous rocks consist mainly of granitic rocks and felsic to intermediate volcanic rocks. We newly found a small gabbro stock (c. 1 km in diameter) with relatively primitive compositions in the central part of Yamaguchi Prefecture. The gabbro stock accompanies the Susuma-Nagaho granodiorite as coeval intrusive rocks. Therefore, we refer to both granodiorite and gabbro as the Susuma-Nagaho Plutonic Complex (SNPC, hereafter). The gabbro can be subdivided into fine-grained gabbro (Fn-gabbro) and coarse-grained cumulus gabbro (Co-gabbro). The Fn-gabbro has a high Mg-number similar to primitive basalt with negative ϵ_{Nd} values corrected to 92 Ma although Cr and Ni contents are relatively low, which indicates that the basaltic magma may have been derived from enriched mantle. In consideration of the geochemical signatures including the Sr and Nd isotopic compositions, the enriched mantle characterized by negative ϵ_{Nd} isotopic values would have existed underneath the Inner Zone of Southwest Japan during the Cretaceous.

Keywords: Late Cretaceous, San-yo Belt, Gabbro, Enriched mantle