

The geochemistry of spinel peridotite xenoliths from the Boeun, Korea

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Upper mantle xenoliths found in alkaline basalts, kimberlites and lamprophyre clans provide information on physical state, chemical composition, and mineralogy of upper mantle. Upper mantle xenoliths in Cenozoic alkaline basalts in South Korea have been found at Boeun, Gangseong, Pyeongtaeg, Asan, Baegryeong Island, and Jeju Island. Boeun is one of the upper mantle xenolith locales and located on the central part of South Korea, but upper mantle xenoliths have never been studied well.

All spinel peridotite xenoliths found in the Boeun are spinel lherzolite and have transitional texture between protogranular and porphyroclastic textures. The sharp boundary and different Sr and Nd isotope ratios between host rock (alkali basalt) and spinel peridotite xenoliths indicate that spinel peridotite xenoliths accidentally trapped by the ascending alkali basalt magma.

The Brey and Köhler geothermometer and O'Neil geobarometer coupled with heat flow-derived geothermal gradients are used to estimate temperature and pressure conditions. The spinel peridotite xenoliths from the Boeun originate at depths from 40 to 63 km, and temperature ranges of the spinel peridotite are from 705 to 1030 °C.

Subcontinental lithospheric mantle (SCLM) beneath the Boeun has undergone small degree of fractional melting (1 - 2%). Some enriched spinel peridotite from the Boeun has undergone cryptic metasomatism by host rock (alkali basaltic melt) or/and previous alkali basaltic melt.

⁸⁷Sr/⁸⁶Sr and ¹⁴³Nd/¹⁴⁴Nd isotope ratios of clinopyroxenes from the Boeun are similar to those of clinopyroxenes in spinel peridotites from the East China, but are different from those of clinopyroxenes in spinel peridotites from the Southwest Japan. These indicate that SCLM composition represented by the spinel peridotites from the Boeun has not been affected by subduction of the Western Pacific margin. The calculated Nd model ages for depleted spinel peridotites using a single stage model are between 1.6 Ga and 2.6 Ga, which indicating a late Archean to early Proterozoic age of partial melting. There is no reasonable the age of basement rocks in Ogcheon belt, but the age of basement rocks in the Gyeonggi massif and the Yeongnam massif beside of Ogcheon belt are 2.0 - 1.8 Ga (Sagong et al., 2003). The age ranges of the basement rocks fall within the model age of SCLM beneath the Boeun. The model ages of SCLM beneath the Boeun are also similar to model age (2.0 Ga) of the spinel peridotites from the Tariat in the central Mongolia and Hannuoba in the East China (Stosch et al., 1986;

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Song and Frey, 1989). Accordingly, the SCLM beneath the Boeun, Hanuoba in the East China, and Tariat in the Central Mongolia are derived from a bulk earth composition at similar time.