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Petrology of mantle xenoliths in alkali basalts from Baegryung and Jeju Island, South Korea: Implication for paleo-geotherm of upper mantle

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Mantle xenoliths in alkali basalts from Baegryung and Jeju islands are mostly spinel lherzolites composed of olivine, orthopyroxene, clinopyroxene, and spinel and accompanied by subordinate amount of spinel harzburgites. These xenoliths generally show triple junctions between grains, kink-banding in olivine and pyroxenes, and protogranular and equigranular textures, with no preferred crystal orientation. Anhedral brown spinels occur interstitially. Minerals are compositionally homogeneous.

Results from pyroxene geothermometers and the Al-solubility and Ca-in olivine geobarometers yield 900-1040˚C and 12-20Kb. The equilibrium temperatures and pressures of xenoliths , as considered in P/T space, belong to the oceanic geotherm, based upon the various mantle geotherms presented by Mercier(1980) and also this geothermal gradient is greater than that of the conventional conductive models. Mineral compositions of spinel-lherzolites in South Korea and eastern China are primitive; paleogeotherms of both are quite similar, but degrees of depletion of the upper mantle could vary locally. This is demonstrated by eastern China, which has various depleted xenoliths caused by different degrees of partial melting.