The petrography and geochemical characteristics of rhoenite in Cenozonic alkalic basalt from Changle, Shandong prinvice

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The focus of the current study is on Cenozoic rhoenite-bearing alkali olivine basalts from Fangshan, Sui shan, and Ergushan, Changle area, Shandong province. Petrographic characteristics show that the rhoenites are products of a reaction between basalt and in parts cm-sized xenocrysts of spinel, corundum, clinopyroxene and olvine. As a function of the xenocryst species involved in the reaction, different rhoenite solid-solution compositions were determined. The mineral assemblages indicate that rhoenites crystallized in a temperature range of 950–1125°C at pressures < 0.5 kbar, with fO_2 below the NNO buffer.

The chondrite-normalized REE patterns of Changle rhoenites show a slight enrichment in light REEs and a depletion of heavy REEs. The REE patterns are very similar to those of kaersutites in the Cenozoic basalts from the South China Sea floor (Yan et al., 2015), and those of kaersutitic amphibole megacrysts in basalts from different localities as in Australia, Japan, New Zealand and America (Irving & Frey, 1984). Furthermore, the rhoenites display pronounced positive anomalies for Nb, Ti and V in primitive mantle normalized spidergrams.

The xenocrysts probably represent broken-up fragments of xenoliths or relics of dissolved xenoliths, carried to the surface by the basaltic melt from mantle depth levels. Previous studies of the rhoenite derived Changle intraplate alkali basalts have demonstrated that they may originate from the ancient Pacific subduction (Dai et al., 2016; Xu et al., 2017).

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