

The petrography and geochemical characteristics of corundum and spinel megacryst in Cenozoic basalt at Changle, Shandong

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The Chinese largest corundum-sapphire deposit is located in Changle, Shandong Province. Changle corundum occurs as megacryst in the Cenozoic basalt, showing roundish shape and having sharp boundary with host basalt. The well developed reaction rim of Al-riched spinel and titanium magnetite around corundum megacryst indicate it is deep mantle derived xenocryst. Besides, the complex reactions of Changle corundum and host basalt indicate the complicated metasomatic processes. The petrography study, for example, the small corundum core is encircled by spinel in the reaction zone (Dong et al., 2007) shows Changle corundum is firstly replaced by spinel at rim, and finally, the whole corundum crystal can be replaced by spinel after the complete metasomatism.

The key elements and their ratios, such as Ga/Mg, Cr/Ga, Fe/Ti, Fe/Mg ratios of two group samples of the corundum megacrysts (CL-1 and CL-2), indicate they are magmatic origin. Spinel in the reaction rim display transitional composition characteristics from corundum to spinel megacryst. In addition, the key element data of corundum and spinel megacrysts exhibit obvious genetic relations. The spinel megacryst, thus, is the product of corundum after melt/fluid metasomatic evolution. However, in compared with the CL-1 group samples, the CL-2 group samples of Changle corundums obviously overprinted by the late melt infiltration metasomatism.

Further more, the components of Changle corundum are similar to Kianjanakanga and Menet sapphires from anorthoclaseite. Consequently, Changle corundums with higher Ga and lower Mg present mineral chemical features of crystallization from alkali melt, which are most likely derived from metasomatic enriched mantle rocks.

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