AGE RELATIONS, MINERAL–CHEMICAL AND ISOTOPIC INVESTIGATIONS ON BASALTIC GEM STONE ZIRCONS FROM EASTERN GERMANY

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Abstract: In alkali basaltic rocks scarcely appear accessory minerals such as zircon and corundum. The origin of these mostly gem stone like mega-crystals is unknown and discussed controversial. Host magmas of the zircon mega-crystals are normally SiO_2 undersaturated (basanites and nephelinites). In several localities we could observe some zircon megacrystals and in a quarry in Saxony (eastern Germany) we collected about 40 crystals up to 15 mm in size in situ from the basanitic rock [1]. Zircons occur in agglutinates of lower crater facies of a scoria cone. The related lava flows are almost free of zircons and their Zr contents reaches up to 900 ppm [2]. There is a good correlation between Ar/Ar data of the basanites (30 to 31 Ma) and the zircon U/Pb data which show ages about 30.5 Ma.

First investigations indicate an alkaline source for zircons which origin possibly from intermediate alkaline melts. This is evidenced by zircon-typology, mineral chemistry and analyses of mineral inclusions and mineral paragenesis in the host rocks [3]. Preliminary in situ Hf-isotopic analyses of zircons indicate an origin from mantle melts. The crystals show an intensive magmatic corrosion in alkali basaltic rocks (including nephelinites), whereas zircons out of phonolites are mostly euhedral. CL images indicate a typical magmatic origin (Fig. 1). Zircons in basaltic rocks have more or less evolved reaction rims, composed mostly of baddeyleit. Zr-contents in the rims of clinopyroxene phenocrystals decreases rapidly with the distance from the zircon inclusions. This indicates late entrainment of zircon crystals into the basanitic melt.

The age data of the zircons in relation to that of the host rocks as well as the mineral chemical and isotopic data imply a cogenetic development of both.

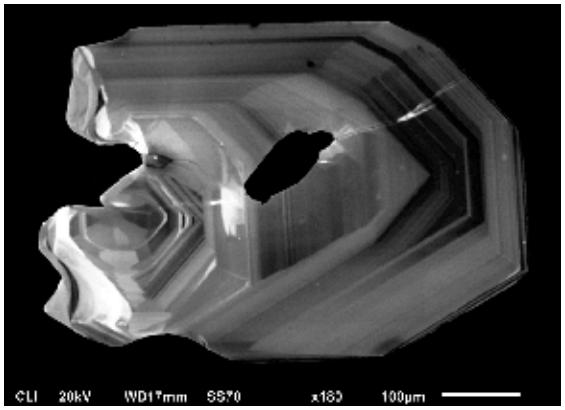

Fig. 1: CL image of a euhedral zircon with oszillating zoning and dissolved margins and dissoluted mineral inclusions.

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