

Anorogenic Gross Spitzkoppe granite stock in central western Namibia: Part II. Structures and textures indicating crystallization from undercooled melt

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ABSTRACT

The anorogenic Cretaceous Gross Spitzkoppe granite stock and associated bimodal dike swarms, are related to continental rifting, which led to separation of Africa from South America. The stock is composed of highly evolved, topaz-bearing, A-type granites. Subhorizontal (≤ 20 m wide) aplite dikes and thinner aplite-pegmatite dikes cut the granites. The contact of the stock and the upper contacts of subhorizontal microgranite-aplite dikes are marked by “stockscheiders” composed of layered aplites and pegmatites. The layering is characterized by rhythmic variations in grain size, grain morphology, and mineral composition. Regular orientation of columnar alkali feldspar crystals, or plumose alkali feldspar-quartz intergrowths and dendritic biotite, indicate unidirectional crystal growth against the heat flow: in the marginal stockscheider toward the stock, in the upper parts of the subhorizontal aplite dikes downward, and in some steeply dipping aplite-pegmatite dikes from both margins inward. These structures and textures are interpreted to result from diffusion-controlled oscillatory nucleation and rapid growth from undercooled melt, coupled with changes in vapor pressure. Crystal growth from undercooled melt, with sparse alkali feldspar megacrysts acting as a substrate for the growing crystals, is indicated also by an irregular dike of orbicular granite cutting the marginal granite of the stock.