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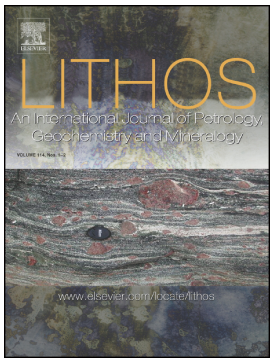

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Metasomatic alkali-feldspar syenites (episyenites) of the Proterozoic Suomenniemi rapakivi granite complex, southeastern Finland

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1. Introduction

Magmatic and subsolidus evolution of alkaline systems is controlled by alkaline fluid phase that often causes alkali metasomatism of the country rocks involved (Bonin, 1988; Kinnaird et al., 1985; Marks et al., 2003; Martin and Bowden, 1981). Interaction of silica-undersaturated fluids and granitic rocks may lead to formation of episyenites characterized by dequartzification, sodium metasomatism and hydrothermal cavity fillings (Cathilineau, 1986; Martin and Bowden, 1981; Petersson and Eliasson, 1997). Fenitization is a corresponding process that affects rocks around carbonatite–ijolite complexes (Le Bas, 1977; McKie, 1966; Preston et al., 2003) and may lead to complete textural and mineralogical resetting of the country rocks, the end products being alkali syenites (e.g. Morogan and Martin, 1985).

The A-type, ferroan Suomenniemi rapakivi granite complex in southeastern Finland contains numerous dike-like bodies of peralkaline, silica-saturated alkali-feldspar syenite and quartz alkali-feldspar syenite (Rämö, 1991). These syenites are the only peralkaline rocks known from the Proterozoic Finnish rapakivi granites, and show wide variation in mineralogy and texture, both of which point to extensive sodic metasomatism. In this paper, we propose that the Suomenniemi alkali-feldspar syenites were formed by desilication of the subalkaline granites of the complex and pervasive subsolidus growth of alkali feldspar and sodic pyriboles, characteristic of fenitization. Our observations are based on petrography, cathodoluminescence imaging, electron microprobe mineral chemistry on feldspars and mafic silicates, whole-rock elemental geochemistry and Nd-Sr isotopes, and single-grain zircon U-Pb and O isotope geochemistry.