Geophysical Research Abstracts
Vol. 13, EGU2011-7909-1, 2011
EGU General Assembly 2011

Low-temperature Fluids and Reaction Veins in Nepheline Syenite from the Seiland Igneous Province, Northern Norway

Xiaoyan Li and Kurt Bucher
University of Freiburg, Germany

Felsic peralkaline igneous rocks crystallize from volatile-rich melts. Residual fluids cause autometamorphism during cooling and may induce metasomatism in country rocks. Textures of nepheline syenite from the Seiland Igneous Province (Northern Norway) indicate a complex succession of reactions during cooling from an igneous crystallization stage represented by clinopyroxene (salite-augite) + sanidine + nepheline + magnetite + ilmenite + calcite at $\sim$750˚C. Early subsolidus reactions indicated by textures are typically REDOX reactions such as hastingsite overgrowth on clinopyroxene. During further cooling, igneous sanidine developed perthite textures, and the nepheline crystals re-equilibrated at a low temperature (< 500˚C), indicated by changing nepheline composition.
Finally, hydrothermal alteration extensively transformed nepheline into fibrous Na-zeolite (natrolite, thomsonite), and produced oligoclase selvages together with small grossular grains where albitization occurred along grain boundaries between perthite and other minerals. The development of hydrothermal alteration is also reflected by pervasive tiny veins (1-5 mm wide) composed of zeolite aggregates and calcite, which accompany symmetrical reddish reaction zones. Compositional variations between reaction zones and unaltered syenite suggest that the alteration reactions involved of a low K/Na (<1) volatile-rich carbonic fluid. This hydrothermal fluid may have been derived from the interaction of meteoric water with massive carbonatite also occurring on Stjernøya during late Caledonian brittle deformation, which also fractured the nepheline syenite so providing routes for fluid migration.