In situ determination of REE in clinopyroxene from syenites

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Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) has became widely used method for the geological applications. In this work, the distribution of rare earth elements (REEs) in clinopyroxene (cpx) was studied. Cpx is significant mineral phase in foid syenite to syenite, which are late differentiates of alkaline–ultramafic Carboniferous igneous suite of Tajno and Ełk (Poland). The analyses were restricted to the phenocrysts with about 400 - 500 μm width, chemically classified as a diopside and eagirine augite.

Determination of the trace element concentrations in cpx were performed by laser ablation system LSX-500 (UV Nd:YAG 266 nm, Cetac) connected to the quadruple mass spectrometer (Elan DRC II, Perkin Elmer Sciex). The ablation conditions (spot diameter, energy and pulse rate) were optimised separately for the rocks and the thin sections.
The applied spot size was 50 or 100 μm. Cpxs were analysed for REE and trace element content using frequency of 10 Hz or 5 Hz. The measurements were carried out *in-situ* in the polished rocks and in thin sections (thickness of ~ 100-120 μm). The same thin sections and polished rock samples of each syenite were also imaged by BSE and analyzed by WDS Cameca SX100 electron microprobe at the aim of the determination of the main chemical components. The synthetic silicate certified reference materials NIST 610 and NIST 612 were used for method calibration and BIR-1, BCR-2 and BHVO-2 were used for the verification of the obtained results. Different element oxides were applied as the internal standards and the results were compared.

Based on the performed analyses we have concluded that:
1) LA-ICP-MS is appropriate method for *in-situ* measurements in the polished rocks and in thin sections of minerals and results are comparable;
2) the pronounced differences in REE content in cpx of different origin were observed;
3) the variation of the REE contents in cpx phenocrysts from alkali silicate host rocks may reflect slightly different melt evolution paths of the complexes with (Tajno syenite) and without associated carbonatites (Ełk syenite).

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