***MINERALOGIA – SPECIAL PAPERS**, 40, 2012*
www.mineralogia.pl

MINERALOGICAL SOCIETY OF POLAND
POLSKIE TOWARZYSTWO MINERALOGICZNE

Composition and growth morphology of feldspar crystals from the Morasko meteorite: LA-ICP-MS and Raman – SEM EDS imaging study

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Alkali feldspar crystals have been recognized in some pieces of the Morasko meteorite. Their major element compositions have been determined by EMPA and LA-ICP-MS. Preliminary data, reported on the basis of EMPA investigations, demonstrated that all the feldspars have a composition either strongly enriched in potassium or in sodium. Also in all of them three end-members of the ternary solid-solution were present. In the albite crystals orthoclase and anorthite components are very low and vary, respectively, from 3.75 to 4.2 and from 0.0 to 0.05. Similarly in K-feldspar albite and anorthite components were also very low, varying, respectively, between 2.34-3.01 and 0.12-0.18. Much more extensive information was obtained through a LA-ICP-MS study. It seems that in Morasko four types of feldspar crystals are present. Their presence is also confirmed by EDS-mapping as well as high resolution chemical Raman imaging. They differ in composition in terms of major and trace elements. In addition to feldspar crystals of almost pure Na- and K- composition, oligoclase and alkali feldspar either highly enriched in the Ab end-member or of ternary composition occur. Some compatible and incompatible elements have been chosen (e.g. Ba, Sr, Rb, LREE, Pb, Ga, Cl) to track the origin of the crystals. All four types display a trace element pattern which systematically changes according to M-site heterovalent substitution, e.g. show a strong geochemical affinity to potassium, sodium or calcium. Oligoclase and alkali feldspar with balanced orthoclase and albite contents are enriched in all the above-mentioned trace elements, except chlorine. Their evolution toward the end-member composition results in drastic trace element impoverishment. Instead, chlorine and trace elements, which typically are transferred by fluids, appear. The feldspars are co-genetic. Changes in their composition are discussed in relation to the major and trace element compositions of the surrounding mineral association.

Acknowledgements: The study was funded by NCN 2011/01/B/ST10/04541.