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# Crystal chemistry of phlogopite from the Kvaløya lamproite (North Norway): preliminary results

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The preliminary results of an investigation aimed at the crystal chemical characterization of phlogopite from the Kvaløya lamproite (North Norway) are reported. The investigation was carried out by combining electron probe microanalysis and single crystal X-ray diffraction.

The Kvaløya dyke represent the first occurrence of lamproite in Scandinavia and its petrogenesis has been recently studied [1]. The authors found that the rock is a high-Si phlogopite lamproite similar to the within-plate or anorogenic types of lamproite from Leucite Hills and Smoky Butte (USA), but also displays similarities with the plate-margin or orogenic type known from the Murchia-Almeria (Spain) province.

Texturally and compositionally, three different generations of mica have been found. The earliest generation is a light brown phlogopite with average chemistry (as oxide wt%) described by MgO 24.71, FeO 3.38, $TiO_2$2.23 , $Al_2O_3$ 10.55, $SiO_2$ 42.24, F 4.57. This phlogopite is rimmed by a dark brown mica having MgO 20.65, FeO 8.62, $TiO_2$ 2.39, $Al_2O_3$ 8.31, $SiO_2$ 43.10, F 4.50. The two earliest generations have apparently been replaced by a third generation green mica with MgO 22.60, FeO 3.52, $TiO_2$ 0.32, $Al_2O_3$ 3.93, $SiO_2$ 52.40, F 6.07.

From a structural viewpoint the three micas display a different behavior. Light brown phlogopite belongs to the $1M$ polytype, with cell parameters $a$ = 5.3202(3), $b$ = 9.2128(4), $c$ = 10.1971(5)Å, $\beta$ = 100.080(4)°. Structure refinements in space group $C2/m$ converged at R values in the range 0.04 - 0.06, with difference Fourier synthesis also evidencing low to moderate structure disorder. From a crystal chemical viewpoint the mica shows feature similar to Ti-poor tetraferri-fluorophlogopite (see [2] and references therein). No single crystal suitable for X-ray diffraction was found so far for the dark brown mica, which at the present state of the investigation, consist of completely disordered stacking sequences. The chemical composition of the green mica is peculiar, being close to that of yangzhumingite, $KMg_{2.5}Si_4O_{10}F_2$ [3]. The results of the first single crystal refinement of yangzhumingite is presented here. The mica is a $1M$ polytype with cell parameters $a$ = 5.2677(3), $b$ = 9.1208(5),$c$= 10.1652(6) Å, $\beta$ = 100.010(4)°. Anisotropic structure refinements in space group $C2/m$ converged at R = 0.03, $R_w$ = 0.04. Average distances are <T-O> = 1.635, <M1-O> = 2.078, <M2-O> = 2.067, $<K\text{-}O>_{outer}$ = 3.138, $<K\text{-}O>_{inner}$ = 3.076 Å. The octahedral sites scattering power refined to 35.3 $e^-$, which is consistent with the electron microprobe derived $(Mg_{2.37}Fe^{2+}_{0.20}Ti_{0.02}\ Cr_{0.01}Ni_{0.01}[]_{0.39})$ octahedral composition, where [] stands for vacancy. Further work is under way (Mössbauer, micro-FTIR, light elements analysis) in order to get further insights into the complex crystal chemistry of the Kvaløya phlogopites.

References

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