MITT.ÖSTERR.MINER.GES. 151 (2005)

FLUORO-MAGNESIOHASTINGSITE: A NEW MEMBER OF THE AMPHIBOLE-GROUP FROM DEALUL UROI, APUSENI MOUNTAINS, ROMANIA

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Fluoro-magnesiohastingsite is a new member of the amphibole group. Both mineral and mineral name have been approved by the International Mineralogical Association (CNMMN, #2005-002). The mineral occurs in small cavities of a xenolith in the trachyandesite of the Uroi-hill, 10 km east of Deva, Hunedoara district, Romania. The xenolith consists of augite, Ti-rich hematite, fluorphlogopite, fluorapatite, plagioclase and enstatite. The fluoro-magnesiohastingsite crystals are often in close association with green augite. Fluoro-magnesiohastingsite is monoclinic and forms idiomorphic, long prismatic crystals up to 3 mm. It has the characteristic perfect cleavage {110} of monoclinic amphiboles, intersecting at ~56°. The colour and the streak of the crystals are reddish-brown and the luster is vitreous.
Fluoro-magnesiohastingsite crystals were analyzed with a Jeol electron microprobe, Jeol JSM-6310, equipped with ED- and WD-spectrometers (analytical conditions: 15kV, 5nA on Al, minerals have been used as standards). The calculation of the empirical formula indicates that the complete iron is ferric. Electron microscope analyses of fluoro-magnesiohastingsite show up to 2.12 apfu Ca, far in excess of the usual maximum value of 2.0 apfu observed in amphibole-group minerals. This indicates that Ca also occupys the A position. The empirical formula of fluoro-magnesiohastingsite, based on 46 negative charges is (average of 15 analyses): $(K_{0.22}\,Na_{0.58}\,Ca_{0.18})_{0.98}\,(Ca_{1.9}\,Mg_{0.1})_{2.0}\,(Mg_{4.13}\,Fe^{3+}_{0.65}\,Al_{0.09}\,Ti_{0.13})_{5.00}\,(Si_{5.86}\,Al_{2.14})_{8.0}\,O_{22}\,(F)_{2.04.}$

The crystal structure of fluoro-magnesiohastingsite, a = 9.872(1), b = 18.007(2), c = 5.314(1) Å, ß = 105.37(1)°, V = 9104.8(6) Å^3, C2/m, Z = 2, has been refined to an R index of 5.9% using 957 observed intensities measured with MoK_α X-radiation (Bruker AXS SMART APEX). From the refinement of the site occupancies and taking into account the calculated interatomic distances the following site populations resulted (apfu): T1: 2.21 Si + 1.79 Al, (T1-O = 1.676 Å), T2: 3.74 Si + 0.26 Al, (T2-O = 1.640 Å), M1: 1.86 Mg + 0.14 Ti (M1-O = 2.063 Å), M2: 1.40 Mg + 0.60 Fe^{3+} (M2-O = 2.051 Å), M3: 0.98 Mg + 0.02 Fe^{3+} (M3-O = 2.058 Å), M4: 2.00 Ca (M4-O = 2.483 Å). Na, Ca and K are disordered around the A(2/m)-site and obtained by electron density at A(2): 0.48 Na and 0.18 Ca and A(m): 0.27 K. There is a significant order of Al at T1 and K at A(m) and the O3 site is fully occupied by F.
The formula from structure refinement is: $(K_{0.27}\,Na_{0.48}Ca_{0.18})_{0.93}\,Ca_{2.00}\,(Mg_{4.24}\,Fe^{3+}_{0.62}\,Ti_{0.14})_{5.00}\,(Si_{5.95}\,Al_{2.05})_{8.00}\,O_{22}\,F_{2.00}$.