MS14-03 | KAHLENBERGITE, A NEW POTASSIUM ß-ALUMINA MINERAL

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Kahlenbergite (IMA 2018-158) is a natural potassium β-alumina, with an empirical formula of $(K_{0.87}Mg_{0.09}Ca_{0.03}Ba_{0.01})_{S1}(Al_{9.46}Fe^{3+}_{1.36}Mg_{0.14}Cr^{3+}_{0.02}Si_{0.02})_{S11}O_{17}$. It occurs in small hematite segregations within wollastonite-gehlenite rocks. The mineral association suggests formation temperature between 1000 and 1200 °C (Sharygin, 2019). Kahlenbergite forms platy, light-brown crystals, epitaxially replaced and overgrown by hibonite. The unit cell dimensions (a=5.64860(6), b=22.8970(3) Å) and space group $P6_3/mmc$ of kahlenbergite corresponds to that of synthetic K β-alumina. The crystal structure was refined using synchrotron diffraction data (beamline X06DA, SLS, PSI). Compared to synthetic K β-alumina, which often shows considerable amounts of positional and occupational cation disorder, the structure of kahlenbergite is fairly simple. It exhibits a fully occupied position of the K atom at (⅔, ⅓, ¼). The structure of kahlenbergite is made of spinel blocks, divided along *c* into mixed (*M*) layers with AlO_6 octahedra and $(Al_{0.56}Fe_{0.44})O_4$ tetrahedra, Kagome (*K*) layers with $(Al_{0.92}Fe_{0.08})O_6$, and pillar (*P*) layers with two AlO_4 tetrahedra and K-atoms. The presented structure model of kahlenbergite describes an idealised ordered structure. All investigated crystals exhibit one-dimensional diffuse scattering. In one crystal additional reflections can be identified, which obviously belong to the Fe^{3+}-analog of hibonite.

The structure of kahlenbergite and the Fe^{3+}-analog of hibonite contain identical blocks, which are connected by *P*-layers in kahlenbergite and so-called *R*-layers in the Fe^{3+}-analog of hibonite. The *R*-layers contain Ca atoms, AlO_5-bipyramids, and further AlO_6 octahedra. Therefore, the connecting layers are most likely the source of the disorder.

[1] Sharygin, (2019) Mineralogical Magazine 83, 123–135