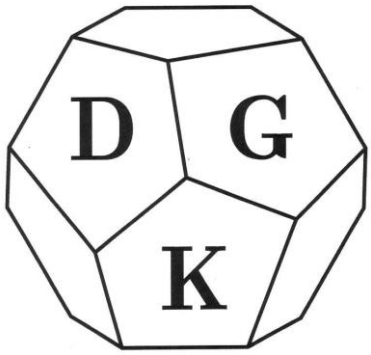
32nd Annual Meeting of the German Crystallographic Society (DGK) e. V.



Abstract book

OP-089

Phase evolution and thermal behavior of hydrous Fe sulfate minerals: coquimbite $AlFe_3(SO_4)_6(H_2O)_{18}$, römerite $Fe^{2+}Fe^{3+}_2(SO_4)_4(H_2O)_{14}$ and aluminocopiapite $Al^{3+}_{2/3}Fe^{3+}_4(SO_4)_6(OH)_2(H_2O)_{20}$

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Hydrated iron sulfates are essential for acid mine drainage (AMD) precipitation as well as for the formation of oxidation zones of ore deposits. They are subjected to transformations under diverse climatic conditions, which include interactions with precipitation and humid atmosphere. A few of these minerals have been found on the surface of Mars under extraterrestrial conditions. The significance of examining the transformations of sulfate minerals occurring on the Mars has been recognized in the context of the potential implementation of the Mars Sample Return Mission. Due to this relevance of the topic, certain inquiries regarding the properties and phase evolution of numerous minerals belonging to this family remain unresolved and subject to debate at present. In our work we report a comprehensive study of the thermal properties and phase transformations of coquimbite $AlFe_3(SO_4)_6(H_2O)_{18}$, römerite $Fe^{2+}Fe^{3+}_2(SO_4)_4(H_2O)_{14}$ and aluminocopiapite $Al^{3+}_{2/3}Fe^{3+}_4(SO_4)_6(OH)_2(H_2O)_{20}$. The stability limits of the specified minerals are reported, substantiated by high-resolution powder X-ray diffraction and thermal analysis. Based on powder X-ray diffraction data for these minerals, the character of thermal expansion was described for the first time. Of particular interest are the results of investigation of the phase transformations of aluminocopiapite under low vacuum conditions – a rare phenomenon previously described only for a few hydrated sulfates. The obtained results expand the field of mineral evolution with sulfate anion over a wide range of physical and chemical conditions.