Crystal Structures of Two Iron-containing Minerals: Sturmanite and Biraite-(Ce) (a New Mineral)

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The crystal structure of two rare iron-containing minerals will be discussed. They contain chemically different anionic groups. Iron, besides occurring in nature in two different oxidation states, has an intermediate ionic radius with respect to other cations. For this reason iron is easily allowed to enter a wide number of different structures, and it can be coupled with many other cations with larger and smaller ionic radii. In the crystal structures being described here, we will see how iron-centered polyhedra can link with cations as different in size as REE's and calcium, on one side, and carbon, on the other side. Sturmanite, $Ca_6(Fe^{3+},AI,Mn)_2(SO_4)_2[B(OH)_4](OH)_{12}\cdot 25H_2O$,

Sturmanite, $Ca_6(Fe^{3+},Al,Mn)_2(SO_4)_2[B(OH)_4](OH)_{12}:25H_2O$, structurally, belongs to the thaumasite-ettringite group. Minerals of this group are either hexagonal (thaumasite) or trigonal (ettringite). In sturmanite, similarly to ettringite, two co-axial elements parallel to [001] can be considered as the most specific structure features. The main one is a polyhedral column formed by Fe-octahedra and Capolyhedra. The second structural element parallel to [001] is formed by [SO₄] tetrahedra and by B(OH)₄ tetrahedra.

Biraite-(Ce), ideally Ce₂Fe²⁺(Si₂O₇)(CO₃), is monoclinic, space group $P2_1/c$, a 6.505(7), b 6.744(2), c 18.561(4) Å, β 108.75(2)°. It displays a new structure type, based on polyhedral sheets (001) composed by pairs of edge-sharing [FeO₆] octahedra, [Si₂O₇] groups, and [CO₃] triangles. Ce³⁺ cations in ten-fold coordination provide the linkage between neighbour polyhedral sheets.

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