Capranicaite: a new mineral from Capranica, Viterbo, Italy

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Capranicaite. (IMA 2009-086) KCaNaAl₅Si₂O₈, is a new mineral found in the Vico volcanic complex at Capranica, Viterbo, Lazio, Italy. It is a Cs bearing orthosilicate with a new topological arrangement of the 2-periodic Si₂O₆ single chains. The name is for the locality, Capranica, where the holotype was found (fig. 1 below).

Occurrence
Capranicaite occurs in mafic lavas of the active Vico volcanic complex at Capranica, Viterbo, Lazio, Italy. It is a Cs bearing orthosilicate with a new topological arrangement of the 2-periodic Si₂O₆ single chains. The name is for the locality, Capranica, where the holotype was found (fig. 1 below).

Crystal and compositional data
Capranicaite is monoclinic, space group P2₁/n.

Crystal structure
The crystal structure of capranicaite consists of three overlapping layers of polyhedra (A, B, and C) normal to the c axis. The A-layer contains the Si₂O₆ chains that extend along a (fig. 4 below).

Physical properties
Capranicaite forms small, thin tabular crystals no longer than 0.1 mm (fig. 2 below). Crystals are colourless, with a white streak and a vitreous lustre; they are not fluorescent and have a good (001) cleavage. Density (calc.) is 2.41 g/cm³. Optically is biaxial (-) with α = 1.495(1), β = 1.543(1), γ = 1.544(1); 2V(obs) = 7.3(2)°.

FTIR spectroscopy
The single-crystal FTIR spectrum (fig. 3 below) shows a group of absorptions from 2289 cm⁻¹ to 2640 cm⁻¹ due to the overtone of the anti-symmetric stretching vibrations of the BO₃ triangular groups. Due to the significant thickness crystal are also present the absorptions due to trace of H₂O/OH; it is not clear if this H₂O/OH are structurally related to the mineral.

Relation to other species
Capranicaite can be placed into the 09 class (silicates) 09.DB family (inosilicates with 2-periodic single chains, Si₂O₆). Pyroxene-related minerals) according to Nickel & Strunz classification, or in the 65 class (inosilicates), 65.01 type (inosilicate single-width unbranched chains, W=1 with chains P=2) accordingly to Dana. However the crystal structure does not show similitude to the series of minerals occurring in these groups.

Crystal structure
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The B-layer is built by isolated AlO₆ tetrahedra and BO₃ triangles connected to form a continuous sheet of six-fold rings (3Al + 3B) (fig. 6 below left). Two B-layers are connected to a single sandwiched A-layer to forms a bi-dimensional B-A-B network. The B-A-B networks contain seven fold cavities not completely populated by K and minor Cs (fig. 6 below right).

The C-layer is constituted by isolated octahedra with a mixed (Ca, Na) population (fig. 7 below left) and links together the adjacent B-A-B bi-dimensional networks (fig. 7 below right). Along c the sequence of layer is C-B-A-B-C-B-A-B-C.