Crystal chemistry of synthetic thallium-aluminosilicate minerals

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Thallium muscovite, thallium feldspar, and thallium nepheline have been synthesized by hydrothermal techniques. The structure refinement of thallium nepheline shows that the positions where the TlO8 polyhedra are located adapt to rather irregular surrounding caused by the inert pair effect. Moreover the electron clouds of O2- considered to be hard bases are not easily deformed in an electrostatic field compared with that of S2-. Inasmuch as the silicate structures afford no preference for extremely distorted polyhedra, the Tl can be crystallized as the sulfide minerals where these cations require no extreme distortion in nature. The effect provides an effective explanation for understanding rare occurrences of silicate minerals containing Sn, Pb, Sb and Bi cations as major components.

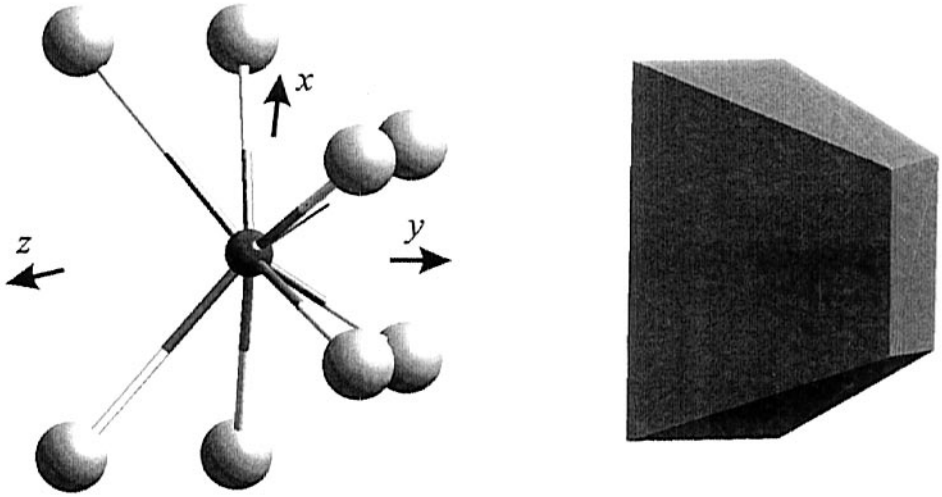

Fig. 1. TlO_8 polyhedron in Tl-nepheline ($TlAlSiO_4$) viewed slightly inclined to the *z*-axis.

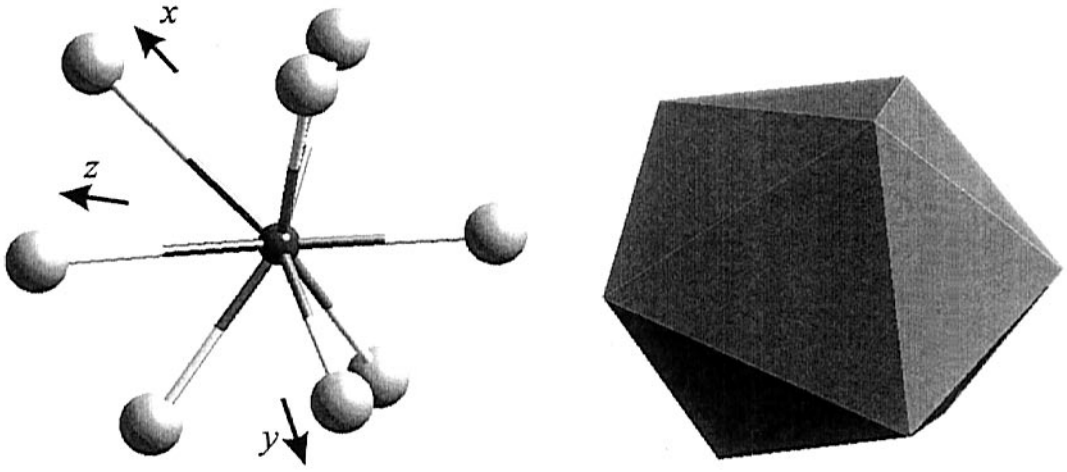

Fig. 2. TlS_8 polyhedron in jankovicite ($Tl_5Sb_9(As,Sb)_4S_{22}$) viewed inclined to the *z*-axis.