RESEARCH FIELD:
Mineralogy

RESEARCH TOPIC:
Stutctural complexity on minerals

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RESEARCH DESCRIPTION:
Titanium silicate minerals are common as accessory minerals in alkaline and peralkaline rocks, mainly agpaitic nepheline syenites and pegmatoid rocks, and often considered as potential microporous materials. The aim of this research theme involves to understand the relations between atomic arrangements in minerals and their chemical compositions, and their potential to be used as microporous materials. Although naturally occurring microporous materials are not usable in industry and technology, most major microporous materials have been modeled after structures of natural zeolites.
In a group of minerals of reasonable complexity in which the structure topology is related but not identical, the general relation between structure topology and chemical composition is not known. This problem is of major theoretical significance in terms of the relation between structure and chemical composition. It is generally not appreciated that the more complicated the structural arrangement and chemical composition of a mineral, the more information that mineral contains on its conditions of formation and on the factors controlling its atomic architecture (note the strong analogy with biological structures here). Titanium silicates are some of the most complicated minerals in Nature, both from the point of view of their structure topology and their chemical formulae.

LABORATORIES OF THE DST IN USE:
Centro Interdipartimentale di Ricerca per lo Sviluppo della Cristallografia Diffrattometrica (CRISDI), SEM-EDS, TEM-EDS

RESEARCH PRODUCTS:

- Cámara, F., Sokolova, and Hawthorne, F.C. (2012) Kazanskyite, $Ba\square TiNbNa_3Ti(Si_2O_7)_2O_2(OH)_2(H_2O)_4$, a Group-III Ti-disilicate mineral from the Khibiny alkaline massif, Kola Peninsula, Russia: description and crystal structure. *Mineralogical Magazine*, 76, 473-492. DOI: 10.1180/minmag.2012.076.3.03
- Sokolova, E., Cámara, F., and Hawthorne, F.C. (2011) From structure topology to chemical composition. XI. Titanium silicates: crystal structures of innelite-1*T* and innelite-2*M* from the Inagli massif, Yakutia, Russia, and the crystal chemistry of innelite. *Mineralogical Magazine*, 75, 2495–2518. DOI: 10.1180/minmag.2011.075.4.2495
- Cámara, F., Sokolova, E. and Hawthorne, F.C. (2011) From structure topology to chemical composition. XII. Titanium silicates: the crystal chemistry of rinkite, $Na_2Ca_4REETi(Si_2O_7)_2OF_3$. *Mineralogical Magazine,* 75, 2755-2774. DOI: 10.1180/minmag.2011.075.6.2755
- Cámara, F., Sokolova, E. and Nieto, F. (2009) Cámaraite, $Ba_3NaTi_4(Fe^{2+},Mn)_8(Si_2O_7)_4O_4(OH,F)_7$. II. The crystal structure and crystal chemistry of a new group-II Ti-disilicate mineral. *Mineralogical Magazine*, 73, 855-870. DOI 10.1180/minmag.2009.073.5.855

- Cámara, F. and Sokolova, E. (2009) From structure topology to chemical composition. X. Titanium silicates: the crystal structure and crystal chemistry of nechelyustovite, a group III Ti-disilicate mineral. *Mineralogical Magazine*, 73, 753-775. DOI 10.1180/minmag.2009.073.5.753
- Sokolova, E., Cámara, F., Hawthorne, F.C. and Abdu, Y. (2009) From structure topology to chemical composition. VII. Titanium silicates: the crystal structure and crystal chemistry of jinshajiangite. *European Journal of Mineralogy*, 21, 871-883. DOI 10.1127/0935-1221/2009/0021-1945
- Cámara, F., Sokolova, E., Hawthorne, F.C. and Abdu, Y. (2008) From structure topology to chemical composition. IX. Titanium silicates: revision of the crystal chemistry of lomonosovite and murmanite, Group-IV minerals. *Mineralogical Magazine,* 72, 1207–1228. DOI 10.1180/minmag.2008.072.6.1207
- Sokolova, E. and Cámara, F. (2008) From structure topology to chemical composition. VIII. Titanium silicates: the crystal chemistry of mosandrite from type locality of Låven (Skådön), Langesundsfjorden, Larvik, Vestfold, Norway. *Mineralogical Magazine*, 72, 887-897. DOI 10.1180/minmag.2008.072.4.887
- Sokolova, E. and Cámara, F. (2008) From structure topology to chemical composition. IV. Titanium silicates: crystal chemistry of barytolamprophyllite. *Canadian Mineralogist*,46, 403-412. DOI 10.3749/canmin.46.2.403
- Cámara, F. and Sokolova, E. (2007) From structure topology to chemical composition. IV. Titanium silicates: the crystal structure and crystal chemistry of bornemanite, a group III Ti-disilicate mineral. *Mineralogical Magazine*, 71, 593-610. DOI 10.1180/minmag.2007.071.6.593

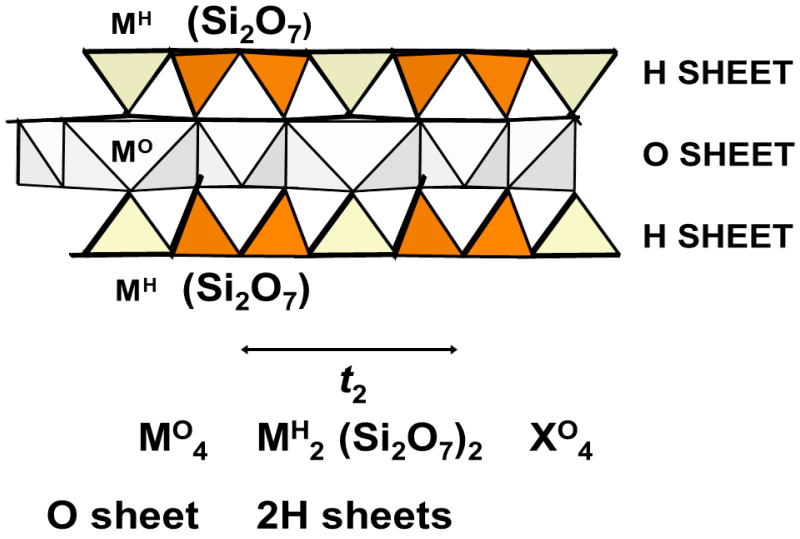

Fig.: The titanium silicate (TS) block.

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