Best BA/MS Thesis - "Fiorenzo Mazzi" Prize

Crystal chemical study of arsenates and vanadates of the brackebuschite supergroup from Valletta mine, Canosio, Val Maira (CN)

Lisa Baratelli,[a] Fernando Cámara Artigas[a]

[a]*Dipartimento di Scienze della Terra "Ardito Desio", Università degli Studi di Milano, Milano, Italy*. *lisa.baratelli@unimi.it*

The aim of this study is the crystal chemical description of arsenates and vanadates of the brackebuschite supergroup, belonging to Valletta mine, in Canosio municipality (CN), Piedmont, Italy, through structure and composition determination.

The Valletta mine is type locality of three new species of the brackebuschite supergroup: canosioite $Ba_2Fe^{3+}(AsO_4)_2(OH)$, grandaite $Sr_2Al(AsO_4)_2(OH)$ and lombardoite $Ba_2Mn^{3+}(AsO_4)_2(OH)$. As-rich minerals probably form by precipitation from hydrothermal fluids in an oxidizing environment. They are concentrated in quartz or calcite-rhodochrosite veins, often associated with baryte, or along the fault planes. They are present in orange-brownish and submillimetric crystalline aggregates.

Minerals of the brackebuschite supergroup have general formula $A_2M^{3+}(TO_4)_2(OH)$, in which:

- A = Pb, Ba, Sr, Ca;
- M = Al, Fe^{3+}, Mn^{3+} (Zn, Cu if an hexavalent is present in the T site);
- T = V, As, P (S, Si).

The crystal structure can be described as composed of infinite chains of sharing edge octahedra $[M^{3+}O_6]$ which extends along the [010] direction. The octahedra chains are connected to each other by two tetrahedra sites $[T^{5+}O_4]$ or $(OH)^-$ groups or a water molecule.

Minerals of the brackebuschite supergroup were characterized by:

- transmission optical microscopy, for the description of thin sections and the measurements of the optical properties;
- scanning electron microprobe (SEM) with EDS and WDS;
- single crystal X-ray diffraction;
- Raman spectroscopy.

Following the analyses it was possible to identify a new lombardoite polytype and a new mineralogical phase of the brackebuschite supergroup; it was called aldomarinoite, in honour of Aldo Marino, researcher and collector, and discoverer of the Valletta mine. Aldomarinoite has chemical formula $Sr_2Mn^{3+}(AsO_4)_2(OH)$ and has recently been approved by IMA (International Mineralogical Association).

The results of this study show that there is a relation between the Raman shifts and the chemical composition of the analysed minerals which would allow identifying different species in terms of peaks position variation in the Raman spectra. This was possible because of the understanding of structural variations obtained through structure refinements.