

STRUCTURE OF NEW SARRABUSITE MINERAL

An old mine in southeastern Sardinia, is well known for the presence of an unusual number of rare secondary minerals

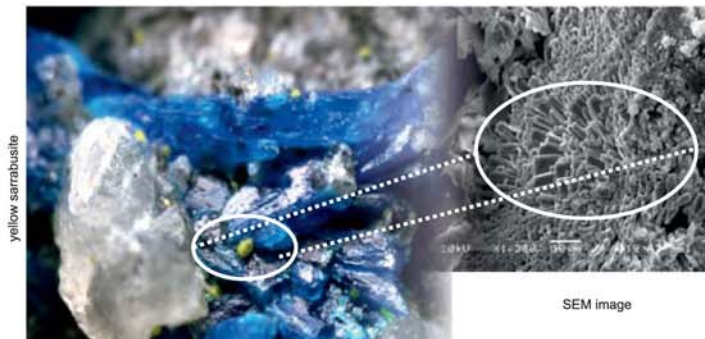
An old lead and arsenic mine is known at Baccu Locci near Villaputzu, in southeastern Sardinia, Italy. This locality is well known among mineralogists and collectors for the presence of an unusual number of rare secondary minerals, among which are selenites such as chalcomenite schmiederite, olsacherite and mandarinoite.

The new mineral Sarrabusite $Pb_5CuCl_4(SeO_3)_3(OH)$ has been discovered in Baccu Locci. It occurs as small lemon-yellow spherical aggregates

The challenge: small crystals (< 10 μm) in small spherical aggregates; scarce sample

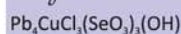
Solution: Manual / Automated 3D diffraction Tomography in combination with precession electron diffraction

of tabular crystals (< 10 μm) of less than 100 μm in diameter. This mineral was discovered in the late 90's and was tentatively assigned as $Pb_2CuCl_3(SeO_3)_3(OH)$ based on EDX. However, owing to the exceedingly small dimensions, no structural study could be performed using conventional X-ray diffraction and the nature of this possibly new species remained unknown for more than a decade. The mineral and the name 'Sarrabusite' (from Sarrabus, the Sardinian



region of occurrence) have been approved by the IMA Commission on New Minerals, Nomenclature and Classification of the IMA (1997-046a)

Crystal Structure



Monoclinic C2/c

a=24.91 Å
b=5.50 Å
c=14.24 Å
 $\beta=101.7^\circ$

Experimental data

tilt range: $\pm 60^\circ$ step: 1°
No ind. reflections: 1515
No ind. atoms: 14
R = 32.9%

The crystal structure has been solved from and refined against electron diffraction of a microcrystal. Four data sets have been measured by both a manual and an automated version of the new electron-diffraction tomography technique combined with the precession of the electron beam.

The Sarrabusite structure is monoclinic and consists of (010) layers of straight chains formed by alternating edge-sharing CuO_2Cl_2 and PbO_8 polyhedra parallel to the c axis, which share corners laterally with two zig zag corner-sharing chains of PbO_4Cl_2 and PbO_4Cl_4 bicapped trigonal prisms.

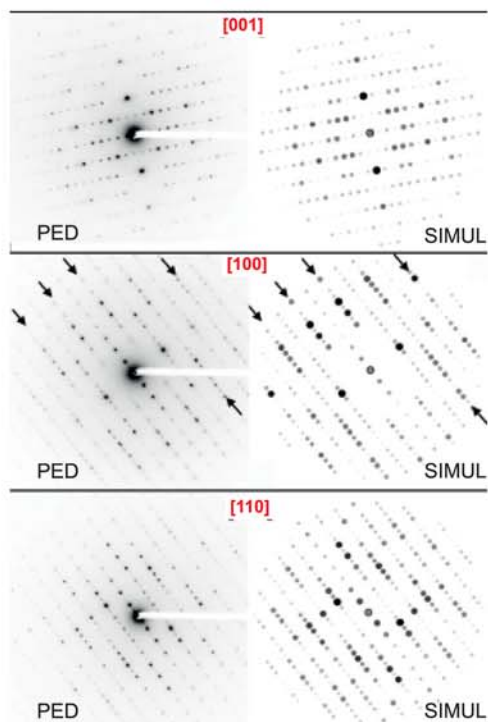


figure 1

PRECESSION ELECTRON DIFFRACTION PATTERNS (LEFT) & KINEMATIC SIMULATIONS (RIGHT)

figure 2

PROJECTIONS OF THE SARRABUSITE STRUCTURAL MODEL OBTAINED WITH MANUALLY COLLECTED DATA

