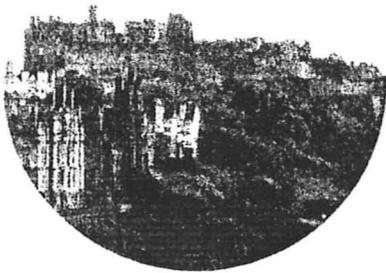


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18th GENERAL MEETING OF THE INTERNATIONAL MINERALOGICAL ASSOCIATION

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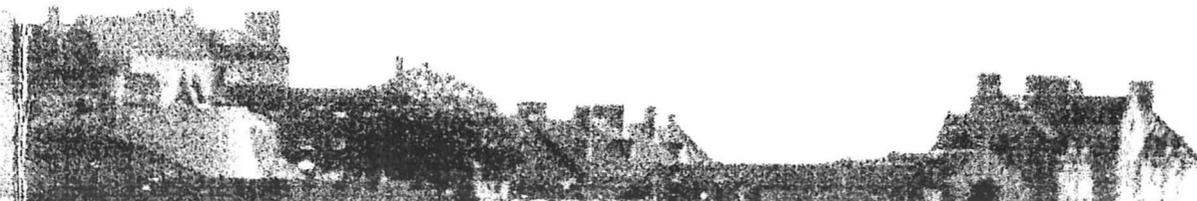


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Session 12 Abstracts

The geological setting of the Lake Boga Granite during the Late Cainozoic involved inundation by the so-called Murray Sea. This was the last vestige of the Murray Basin, in which up to 600 m of Tertiary sediments accumulated. The Lake Boga Granite and other granite outcrops at Wycheproof and Pyramid Hill represent pre-Tertiary topography. The Lake Boga Granite has been covered by a veneer of Quaternary sands, indicating it would have been completely immersed by seawater. During the retreat of the Murray Sea to the southwest over the past 5 million years, there have been multiple fluctuations in climate and sealevel. Cool windy dry conditions with low watertables alternated with temperate wet conditions with high-level acidic watertables. These conditions favoured the concentration of chlorine, iodine and bromine in groundwaters through the region, resulting in the salinisation that is a feature of inland arid Australia. In the Lake Boga Granite, near-surface miarolytic cavities containing the requisite primary mineral assemblages could therefore have been within the zone of fluctuating groundwater. This combination of factors is likely to have generated the conditions required for the unusual secondary minerals to crystallise.

MM5: Roscherite-group minerals from Brazil

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The general formula of roscherite-group minerals is $\text{Ca}_2\text{Be}_4\text{Me}_5(\text{PO}_4)_6(\text{OH})_4 \cdot 6\text{H}_2\text{O}$. The valid species are roscherite ($\text{Me} = \text{Mn}^{2+}$), zanazziite ($\text{Me} = \text{Mg}$), and greifensteinite ($\text{Me} = \text{Fe}^{2+}$). They are monoclinic but triclinic polytypes were also described. Several roscherite-group minerals were quoted from Brazil. A monoclinic Fe^{3+} -dominant mineral was described from Sapucaia mine, Galiléia, Minas Gerais, under the name "roscherite". A monoclinic Fe^{2+} -dominant "roscherite" (= greifensteinite) was quoted from Lavra do Ênio (also known as Boa Vista farm), Galiléia, Minas Gerais. Unanalyzed "roscherite" occurs at Alto Serra Branca, Pedra Lavrada, Paraíba. Another unanalyzed "roscherite", with very high refractive indices, was described from Córrego Frio pegmatite, Linópolis, Divino das Laranjeiras, Minas Gerais. Zanazziite from Lavra da Ilha pegmatite, Itinga, Minas Gerais, was originally cited as "roscherite". Additional zanazziite occurrences were described from Pirineus mine, Itinga, Minas Gerais, and Pomarolli farm, Linópolis, Divino das Laranjeiras, Minas Gerais. A triclinic Fe-dominant "roscherite" occurs at Lavra da Ilha pegmatite, Itinga, Minas Gerais. No efforts were made to test if Fe is predominantly 2+ or 3+ in this sample. Three new occurrences, all in Minas Gerais State, were studied: (1) Pomarolli farm, Linópolis, Divino das Laranjeiras, as brown aggregates, associated with moraesite and beryllonite; (2) Lavra do Telírio, Linópolis, Divino das Laranjeiras, as green aggregates, associated with eosphorite; and (3) São Geraldo do Baixio, as brown aggregates, associated with moraesite. The crystals from the three occurrences showed considerable zoning with respect to Fe (greifensteinite or a Fe^{3+} -dominant species) and Mg (zanazziite). Fe is predominantly 3+ in the Pomarolli farm sample. Refractive indices are very high for this mineral. Unfortunately, the small amount prevented checking the valence state of iron in the other two samples.

MM6: Crystal Structures and Topology of Rare and New Arsenates, Silicates and Oxides

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This work summarizes the results of XRD studies of six new and rare minerals (arsenates – pushcharovskite and tillmannsite, berylliosilicate – sphaerobertandite, Zr,Ti-silicates – seidozerite and delindeite and oxide – bismutocolumbite) recently discovered at Cap Garon, Var, France, in the copper mines of Roua, Alpes-Maritimes, France, in Lovosero alkaline massif, Russia, and in miarolytic pegmatites of the Central Transbaikalia in Russia. The structures of these minerals are considered in the light of the main problems of mineralogical crystallography:

(1) The use of synchrotron radiation opens the gate to a new branch of microgeochemistry (~20% of known minerals lack a structure determination, mainly because crystals are too small or imperfect for laboratory X-ray sources). As an example the structures of tillmannsite and of pushcharovskite are discussed. The structure of tillmannsite, $(\text{Ag}_3\text{Hg})(\text{V},\text{As})\text{O}_4$, contains the isolated $(\text{V},\text{As})\text{O}_4$ tetrahedra and the tetrahedral clusters (Ag_3Hg) with a disordered distribution of Ag and Hg atoms within it. The structure of pushcharovskite, ideally $\text{CuAsO}_3(\text{OH}) \cdot 1.5\text{H}_2\text{O}$, comprises heteropolyhedral sheets formed by Cu_2O polyhedra and by As_2O_7 tetrahedra. The atomic arrangement of pushcharovskite corresponds to a lower

packing density compared with other chemically related supergene secondary alteration hydrated geminite, lindackerite and yvonite discovered in paragenesis with it.

(2) The new techniques complement the characterization of the earlier discovered rare minerals. As an example, the crystal structure of sphaerobertandite, $\text{Be}_3\text{SiO}_4(\text{OH})_2$, is considered. Structural similarity between Be- and Zn-silicates is discussed.

(3) The results of the structural study of bismutocolumbite at high pressure indicate that the phase transition from centrosymmetric (*Pma*) structure to polar (*Pna2_1*) one occurs at the pressure ~ 3 GPa. These structure changes can be attributed to the different stereochemical activities of the lone pairs of electrons associated with Bi^{3+} and Sb^{3+} .

(4) The structural studies of delindeite and of seidozerite allowed us to consider a large group of bafetisite-like minerals as the members of a meroplesiotypic series. The heterophyllosilicate HOH layer which, at a first approximation, represents the common module in this series while the interlayers are variable (merotypism), may modify this kind of structures in different members (plesiotypism).

The new approaches in X-ray crystallography give a new insight to the structural classification of minerals, to the nature of complicate crystal chemical phenomena (isomorphic replacement, modulation, polyhedral stacking variations, etc.), to the further development of modular theory of crystals and some other problems of modern structural mineralogy and crystal chemistry.

MM7: The mineralogical status of "cavolinite" from Vesuvius, Italy and crystallochemical data on the davyne-subgroup

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Since its description in 1825 as a new mineral from the Monte Somma caldera, Vesuvius, 'cavolinite' has been for long a source for debate and confusion. Now, 'cavolinite' is simply considered as an obsolete name for nepheline, $(\text{Na}_3\text{K})[\text{Al}_4\text{Si}_4\text{O}_{16}]$.

In order to shed some light on the status of this mineral, 13 specimens labelled as 'cavolinite' were revisited by X-ray diffraction, electron microprobe, and Raman spectroscopy. First, the X-ray powder method shows that all the specimens turn out to belong to the davyne subgroup of the cancrinite group. However, among the samples investigated, two populations of 'cavolinite' are distinguishable. 'Cavolinite' crystals lining small vugs exhibit a prismatic habit, have a chemical composition with about 3.3 Cl per formula unit, and are poor in sulphate (0.01 to 0.08 SO_4^{2-} p.f.u.). Moreover, they show superstructure reflections doubling the parameter *a* of the hexagonal unit cell (*a* = 25.8 and *c* = 5.4 Å). These crystals correspond to quadridavyne, $[(\text{Na},\text{K})_6\text{Cl}_2](\text{Ca}_2\text{Cl}_2)[\text{Si}_6\text{Al}_6\text{O}_{24}]$. 'Cavolinite' filling up large geodes of the second population occurs as entangled platelets or fibrous masses. The chemical compositions of these samples reveal about 2.2 Cl p.f.u. and are richer in sulphate (0.4 to 0.7 SO_4^{2-} p.f.u.). As no superstructure reflections were observed along the *a* axis, the cell parameters (*a* = 12.75 and *c* = 5.35 Å) correspond to those of davyne $[(\text{Na},\text{K})_6(\text{SO}_4)_{0.5}\text{Cl}](\text{Ca}_2\text{Cl}_2)[\text{Si}_6\text{Al}_6\text{O}_{24}]$. The two populations are also distinguishable by Raman spectroscopy, by comparing the relative intensity of the vibration peaks of SO_4 at about 990 cm^{-1} . Whereas the presence of OH groups can be tentatively seen, the presence of CO_3 groups is clearly detected in a few samples. The vibration peak for CO_3 (at about 1050 cm^{-1}) is particularly intense in one sample and the refined crystal structure of it is in good agreement with the structure of a carbonate-bearing davyne. Owing to 160 point analyses performed on the whole collection of samples by electron microprobe, a plot of the alkali contents p.f.u., Na vs. K, shows a complete solid solution between two channel contents, $\text{Na}_{3.6}\text{K}_2$ and $\text{Na}_{3.4}\text{K}_{0.4}$. It must be pointed out that the two populations can be recognized here again. All the 'cavolinite' samples belonging to the quadridavyne species show a broader range of the Na ↔ K variations than those identified as davyne.