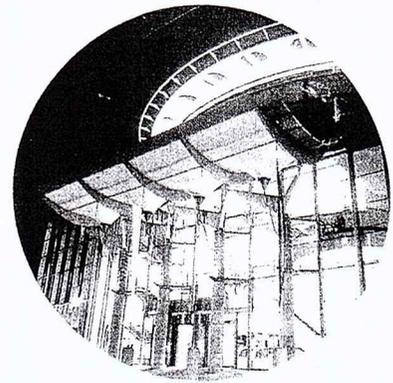
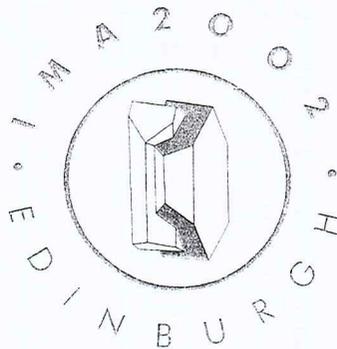
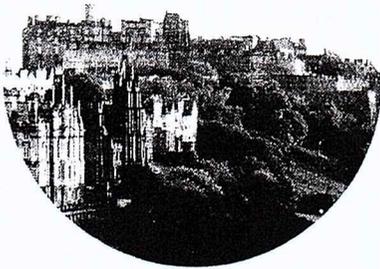


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# 18th GENERAL MEETING OF THE INTERNATIONAL MINERALOGICAL ASSOCIATION

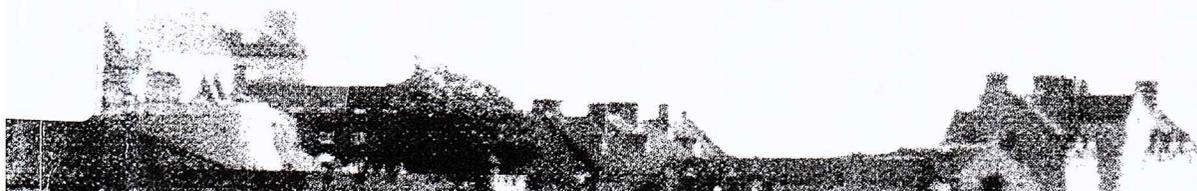
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## Session 12 Abstracts

dominant), bariomicrolite, stannomicrolite, uranmicrolite and transitional species between stannomicrolite and uranmicrolite, and between bariomicrolite and stannomicrolite.

### A12-26: Tuperussuaite from Poços de Caldas, Minas Gerais, Brazil

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Tuperussuaite has been reported and described as occurrences in veins or cavities in the Ilmaussaq alkaline intrusion in South Greenland, in the Aris phonolite in Namibia and in the Mont Saint-Hilaire and Saint Amable sill, in Canada. The Brazilian tuperussuaite comes from an abandoned tinguaita quarry (Bortolan) in Poços de Caldas, State of Minas Gerais.

Small amounts of the mineral were collected as finely fibrous tufts, 1–3mm long needles or fan-shaped aggregates filling spaces between well formed crystals of Na-K-feldspar, sodalite, natrolite, aegirine and hainite, that project from the walls of miarolitic cavities. They are also associated with rare long needles of a still unidentified mineral, presently under study.

The mineral is monoclinic, space group  $C2/m$ . The 7 strongest X-ray powder diffraction lines are [ $d$  in Å ( $I/I_0$ )( $hkl$ )]: 10.96(100)(110), 5.433(3)(130), 4.490(3)(040), 3.736(3)(240), 2.641(1)(150), 2.313(4)(22-2), 2.263(3)(13-2).

Analysis by electron microprobe, on average of seven points, wt.%: SiO<sub>2</sub> 52.49 (45.00–58.60), Al<sub>2</sub>O<sub>3</sub> 0.30 (0.20–0.48), Fe<sub>2</sub>O<sub>3</sub> 25.10 (23.03–27.20), MnO 0.41 (0.35–0.51), MgO 0.15 (0.13–0.19), ZnO 0.20 (0.12–0.29), CaO 0.13 (0.10–0.19), Na<sub>2</sub>O 4.37 (2.54–5.66), K<sub>2</sub>O 0.73 (0.55–0.94), H<sub>2</sub>O 16.12 (Fe<sub>T</sub> as Fe<sub>2</sub>O<sub>3</sub>, H<sub>2</sub>O by difference); total 100%. The standards used were: Si, Mg, Mn, Fe: Mn-hortonolite; Al, Ca: anorthite; Ti: rutile; Zn: smithsonite; Na: albite; K: microcline. FeO, Fe<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O may be discriminated further by the gathering and analysis of larger sample amounts.

The empirical formula based on Si + Al = 8.00, is:

(Na<sub>1.28</sub> K<sub>0.14</sub> Ca<sub>0.02</sub>)<sub>Σ 1.44</sub> (Fe<sup>3+</sup><sub>2.86</sub> Mn<sup>2+</sup><sub>0.05</sub> Mg<sub>0.03</sub> Zn<sub>0.02</sub>)<sub>Σ 2.96</sub> (Si<sub>7.95</sub> Al<sub>0.05</sub>)<sub>Σ 8.00</sub> O<sub>20</sub>(OH)<sub>2.19</sub>. 7.06 H<sub>2</sub>O. The suggested ideal formula is: Na Fe<sup>3+</sup><sub>3</sub> Si<sub>8</sub>O<sub>20</sub> (OH)<sub>2</sub>. 7 H<sub>2</sub>O

Needles measure at most 3x0.003 mm, a size exceedingly small for precise determinations. Two samples from two different miarolitic cavities furnished the data:

Cavity 1	Cavity 2		
Biaxial (+)	2V =	large	large
$\alpha \perp c$	= 1.556 (5) 1.548 (5)	pleochr.:	colourless
$\beta \perp c$	= 1.565 (5) 1.560 (5)	pleochr.:	light green
$\gamma \perp c$	= 1.662 (3) 1.648 (3)	pleochr.:	red brown
$\gamma - \alpha$	= 0.106	0.100	

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### A12-27: Stoichiometry-based estimates of ferric iron in calcic, sodic-calcic and sodic amphiboles: A comparison of various methods

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One of the most notable drawbacks of the electron microprobe is its inability to quantify the different valence states of elements – particularly iron – in routine work. Although ferric/ferrous iron ratios are usually calculated considering electroneutrality and perfect stoichiometry, in the case of amphiboles, there is no unique criterion that can be applied to all compositions.

Using a dataset of 554 analysis of calcic, sodic-calcic and sodic amphiboles from A-type granites and syenites from southern Brazil, we assess the choices made by the method of Schumacher (1997, *The Canadian Mineralogist*, 35, 219–246), which uses the mean between selected maximum and minimum estimates. The maximum estimates selected with higher frequency are: 13 cations excluding Ca, Na and K (13cCNK – 66%); sum of Si and Al equal to 8 (8SiAl – 17%); and 15 cations

excluding K (15eK – 8%). These selections may be considered appropriate based on crystallographic considerations. The minimum estimates are mostly all iron as Fe<sup>2+</sup> (all Fe<sub>2</sub> – 71%), which are too unrealistic for these amphiboles. Hence, the maximum estimates should better approximate the actual values.

To test this hypothesis, three datasets of calcic, sodic-calcic and sodic amphiboles were selected from the literature and the calculated values are compared to those independently measured. In general, 13cCNK and the maximum estimates of the method of Schumacher (mainly 13cCNK but also 8SiAl and 15eK) are satisfactorily precise and accurate (concordance correlation coefficient –  $rc = 0.83$  and  $0.85$ , respectively). Since the actual values are much closer to the maximum estimates than to the minimum ones, the averages between them yield poor estimates ( $rc = 0.56$ ).

Thus, it is recommended that, for calcic, sodic-calcic and sodic amphiboles, the maximum estimates of the method of Schumacher (1997) be used instead of the average ones.

Although ferric iron is underestimated when the oxy-amphibole component is present, the overall cationic distribution is correctly calculated. A correction procedure is conceived, but should be applied with caution.

### A12-28: Catalanoite, Na<sub>2</sub>H[PO<sub>4</sub>].8H<sub>2</sub>O, a new evaporite mineral from Santa Maria alkaline lagoon, Los Andes department, Salta province, Argentina.

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Catalanoite, Na<sub>2</sub>H[PO<sub>4</sub>].8H<sub>2</sub>O – *lbca*, has been found at Santa Maria, a saline environment of white trona strata, about 5 km east of the Chile-Argentina border, in the Andean Puna, Los Andes department, Salta province, Argentina (Lat. 24° 06' S, Long. 67° 23' W). In the lacustrine salt deposit of Santa Maria lagoon, 1,500 m long, 400 m wide and 4575 m above sea level, the associated minerals are major trona, with gaylussite, catalanoite and minor halite. Catalanoite origin is primarily from this desert playa lake, where the evaporate minerals are formed. Catalanoite crystal size ranges from less than 50 micrometers up to half a millimeter across. It is transparent and colourless, with vitreous to resinous luster, and no fluorescent under long or short-wave ultraviolet light. It has white streak, no cleavage or visible twinning, uneven fracture, and fragile tenacity. Hardness Mohs' 2. Density<sub>calc.</sub> 1.728 g/cm<sup>3</sup>. Orthorhombic symmetry *mmm*, *lbca* space group, with  $a = 11.4886(15)$ ,  $b = 11.6467(17)$ ,  $c = 16.4351(18)$  Å.  $Z = 8$ ,  $V = 2199.082(2)$  Å<sup>3</sup>. Cell parameters are refined from powder diffraction data. The  $a:b:c = 0.9863:1:1.4111$  (from unit cell parameters). The idiomorphic crystals show two contrasting habits: bipyramidal and tabular. Forms:  $a \{100\}$ ,  $b \{010\}$ ,  $d \{hkl\}$ ,  $e \{h'k'l'\}$ . Main X-ray powder diffraction data<sub>obs.</sub>: 5.78 (4) {112}, 4.89 (4) {211}, 4.73 (6) {022}, 3.750 (8) {213}, 3.159 (3) {231}, 2.8763 (8) {400}, 2.7820 (10) {141}, 2.7443 (7) {042}, 2.7281 (4) {314}, 2.6008 (3) {116}, 1.9909 (4) {523}, 1.8017 (3) {255}. Also 4-circle studies were undertaken to solve the crystal structure. Optical refractive indices:  $\alpha = 1.443(1)$ ,  $\beta = 1.457(1)$ ,  $\gamma = 1.458(2)$ . Birefringence: 0.015. Biaxial negative (-). Optic axial angle:  $2V_{calc}$  29°42';  $2V_{meas}$  29°36' (Mallard), for wavelength 589 nm. Optical orientation:  $X = a$ ,  $Y = b$ ,  $Z = c$ . Pleochroism: none,  $X=Y=Z$ =colourless. Dispersion  $r > v$  strong. Chemical analyses were carried out by AAS (Atomic Absorption Spectroscopy) MOAS (Molecular Optical Absorption Spectroscopy) and microanalytical wet data: Na<sub>2</sub>O 22.37; P<sub>2</sub>O<sub>5</sub> 24.87; H<sub>2</sub>O 53.38; Total: 100.62 wt.%. Chemical empirical formula: H<sub>17</sub>Na<sub>2</sub>O<sub>12</sub>P (based on 12 O atoms). The Gladstone-Dale relationship compatibility  $(1 - (K_p/K_c)) = 0.022$ . Catalanoite lacks closely crystallochemical relationship to other species, but it is the third sodium phosphate after nahpoite, Na<sub>2</sub>[HPO<sub>4</sub>], and dorfanite, Na<sub>2</sub>[HPO<sub>4</sub>].2H<sub>2</sub>O. Catalanoite is the first genuine evaporite mineral for the phosphate groups in the System of Mineralogy. Named after Luciano R. Catalano (1890-1970), Argentine economic geologist. The mineral form was submitted to CNMMN-IMA.

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