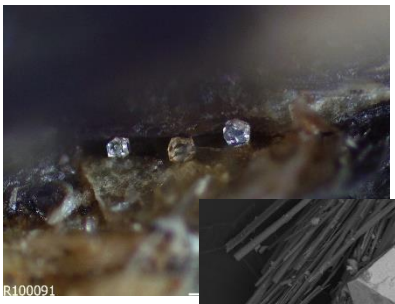
Wilancookite, a new beryllophosphate from Minas Gerais, Brazil

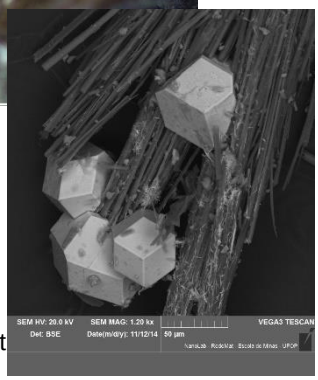
Frédéric HATERT[1], Simon PHILIPPO[2], Luisa OTTOLINI[3], Fabrice DAL BO[1], Ricardo SCHOLZ[4], Mário L.S.C. CHAVES[5], Hexiong YANG[6], Robert T. DOWNS[6], and Luiz A.D. MENEZES FILHO[7]

Introduction

- **Wilancookite** is a new beryllophosphate mineral.
- **Occurrence:** Lavra Ponte do Piauí granitic pegmatite, Itingua, MG, Brazil.
- **Chemical formula:** $(Ba,K,Na)_8(Ba,Li,[])_6Be_{24}P_{24}O_{96}\cdot 32H_2O$
- **Space group** *I*23, a = 13.5398(2) Å.
- **Crystal structure** shows a zeolite-RHO framework similar to that of pahasapaite.
- **Dedicated to** William R. Cook (1927-2006) and his wife Anne.
- **Accepted by IMA-CNMNC:** IMA 2015-034.

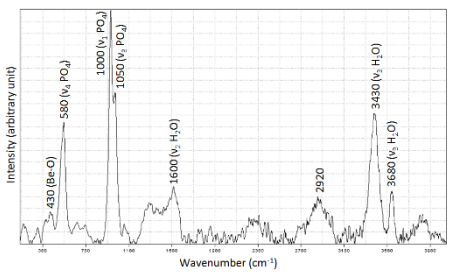
Physical properties





- Colorless
- Dodecahedral {110} crystals
- Diam. 100 µm
- D = 3.05 g/cm^3
- Isotropic
- n = 1.560(2)
- Non-fluorescent

Raman spectrum



Chemical composition (SIMS, EMPA)

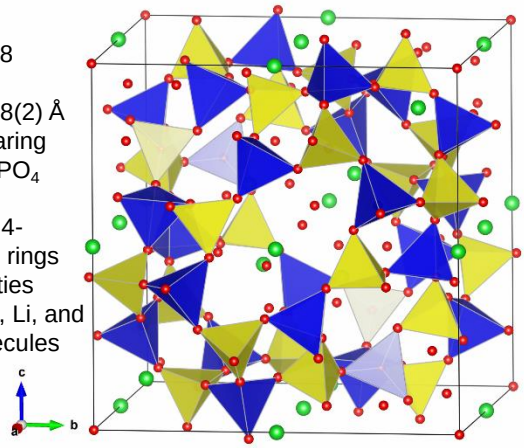
Constituent	Mean (wt. %)	Range	Stand. Dev.	Atoms pfu
P_2O_5	36.19	33.39-37.29	1.18	23.879
SiO_2	0.04	0.01-0.07	0.02	0.030
Al_2O_3	0.41	0.27-0.61	0.10	0.380
BaO	34.65	34.07-35.01	0.34	10.581
Na_2O	0.09	0.06-0.13	0.03	0.142
K_2O	0.32	0.26-0.43	0.06	0.319
BeO	12.86	-	0.09	24.077
Li_2O	0.50	-	0.01	1.567
H_2O^*	12.31	-	-	64.000
Total	97.37	93.86-98.59	1.41	

$(Ba_{7.54}K_{0.32}Na_{0.14})_{\Sigma 8.00}(Ba_{3.04}Li_{1.57}[]_{1.39})_{\Sigma 6.00}Be_{24.08}(P_{23.88}Al_{0.38}Si_{0.03})_{\Sigma 24.29}O_{96}\cdot 32H_2O$

Crystal structure determination

- 4-circle diffractometer, Rigaku Xcalibur, EOS CCD detector
- MoKα radiation, λ = 0.71073 Å
- Crystal size: 0.089 x 0.070 x 0.065 mm.
- Range: 4.28 to 57.14° 2θ
- Total 1292 reflections, of which 805 unique.

- R_1 = 0.0458
- SG: *I*23
- a = 13.5398(2) Å
- Corner-sharing BeO_4 and PO_4 tetrahedra
- 8-, 6-, and 4-membered rings
- Large cavities contain Ba, Li, and water molecules



Conclusions

- Structure of wilancookite similar to those of zeolite-RHO and pahasapaite. However, the positions of Ba atoms and water molecules differ significantly from those of Ca and Li in pahasapaite.
- Only the second Ba beryllophosphate reported to date, after minjiangite, $BaBe_2(PO_4)_2$.

Addresses:
1. Laboratory of Mineralogy, University of Liège, Belgium.
2. Natural History Museum, Luxembourg.
3. CNR-Istituto di Geoscienze e Geoorisorse, Pavia, Italy.
4. Universidade Federal de Ouro Preto, Brazil.
5. Universidade Federal de Minas Gerais, Brazil.
6. Department of Geosciences, University of Arizona, USA.
7. Rua Esmeralda 534, Prado 30410-080, Belo Horizonte, MG, Brazil.