CRYSTAL CHEMISTRY OF THE LONDONITE-RHODIZITE SOLID SOLUTION

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Introduction

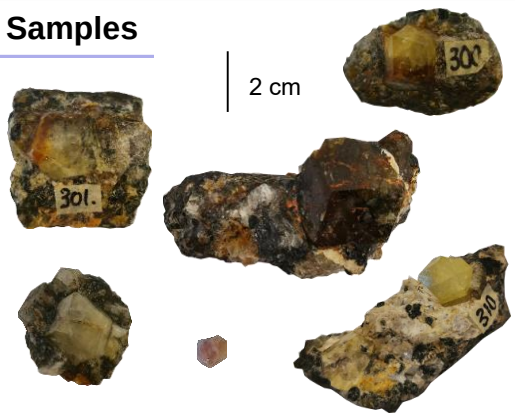
- Londonite and rhodizite are rare minerals belonging to the borate class, which mainly contain beryllium, aluminium, as well as large alkaline cations.
- Potassium and caesium can substitute to each other to form a complete solid solution between the two end-members: londonite, $CsBe_4Al_4(B_{11}Be)O_{28}$, and rhodizite, $KBe_4Al_4(B_{11}Be)O_{28}$.
- The samples were collected in the lithium caesium-tantalum (LTC) (1) granitic pegmatites of Fiakarandava and Antandrokomby, Madagascar (2).
- The crystals show various colours: yellow, pink, brown, orange or colourless.

Location

Madagascar central

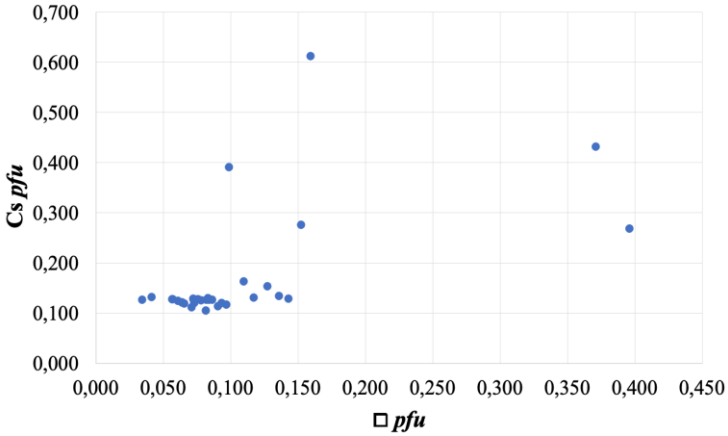
modified after Laurs et al., 2002

Samples



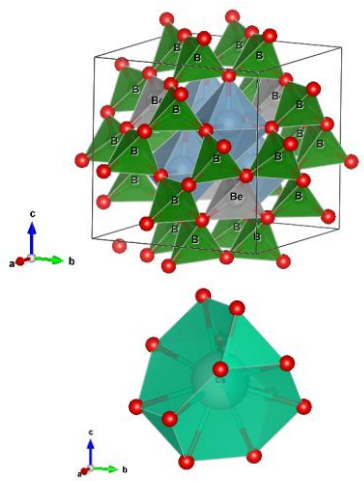
1. Gatta, G.D., Vignola, P., McIntyre, G.J. & Diella, V. (2010). *American Mineralogist*, 95(10), 1467–1472.
2. Laurs, B.M., Pezzotta, F., Simmons, W.B., Falster, A.U. & Muhlmeister, S. (2002). *Gems and Gemology*, 38(4), 326–339.

Correlation between Cs *pfu* and the number of vacancies *pfu*



Crystal structure

- B-rich and Be-rich tetrahedra are shown in green and grey;
- Al octahedra in blue;
- Red spheres represent oxygen;
- The large truncated tetrahedra in light green represent the alkali site at the unit cell origin.



Conclusion

- The results given by EPMA show that an actual correlation between the Cs *apfu* an the number of vacancies *apfu* can be observed. The samples presenting the most vacancies are londonites. In some samples, the number of vacancies can reach 0.40 *apfu*, which is close to the new species "kenolondonite" not yet described in the literature.
- Samples with the most aluminium, the most boron and less beryllium, are also the ones with the most vacancies on the large site, which could indicate the following substitution mechanism: $(K, Cs, Rb)^+ + Be^{2+} = \square + (Al^{3+}, B^{3+})$.
- In addition, chemical analyses revealed the presence of trace elements Fe, Li, Pb, Na, Mg and Mn in these minerals. Overall, a correlation between the macroscopic colour and the trace elements can be observed; these elements are therefore probably responsible for the colour observed in the minerals.