

## Lithium's role in the crystal chemistry of beryl

Khomenko, Vladimir<sup>1</sup> Wiedenbeck, Michael<sup>2</sup> Gottschalk, Matthias<sup>2</sup> Franz, Gerhard<sup>3</sup>

<sup>1</sup>Institute of Geochemistry, Mineralogy and Ore Formation, 03142 Kyiv, Ukraine <sup>2</sup>GeoForschungsZentrum Potsdam, Telegrafenberg, 14473 Potsdam <sup>3</sup>Technische Universität Berlin, Ackerstr. 71-76, 13355 Berlin

We have investigated the Li, Be, Al and Si contents of both synthetic and natural beryl crystals including samples obtained from a spectrum of lithologies representing both metamorphic-metasomatic as well as pegmatitic sources. The absolute contents of the various elements were investigated by electron microprobe and SIMS, in addition to X-ray powder diffraction and FTIR-spectroscopy to characterize the structural details. This work focuses on the distribution of Be<sup>2+</sup>, Al<sup>3+</sup> and Si<sup>4+</sup> on the tetrahedral sites, and on the substitution mechanism responsible for the incorporation of Li<sup>+</sup> into the beryl structure. Both BeO and Li<sub>2</sub>O were successfully quantified by SIMS at the circa 5 μm scale. For the 12 crystals, which have been studied so far, the BeO concentrations range between 12 to 14 wt%, whereas Li concentrations are in the range of ca 40 μg/g to 1150 μg/g. The accompanying range of SiO<sub>2</sub>-contents is ≈ 62 to 67 wt%, and that of Al<sub>2</sub>O<sub>3</sub> 14.4 to 18.5 wt%. Detailed analysis of polarized IR spectra in the regions of H<sub>2</sub>O vibrations, measured on beryl crystals with different Li content, was carried out to check for the possible involvement of OH with the Li substitution. Results and possible interpretation of the components of a complex envelope at 3700-3300 cm<sup>-1</sup> in the beryl spectra will be discussed. Comparison of two crystals with high (4645 μg/g wet chemistry determination) and low Li content (55 μg/g SIMS determination; 90 μg/g wet chemistry determination) resp., show significantly larger lattice constants of the Li-rich beryl: a = 9.2161(3) Å, c = 9.2001(6) Å and V = 676.74(6) Å<sup>3</sup> 2 σ compared to a = 9.2061(4) Å, c = 9.1873(5) Å, V = 674.34(5) Å<sup>3</sup>.

Our data show no clear correlation between Be and Li in the studied samples. Li is heterogeneously distributed in most crystals, especially in hydrothermal grown synthetic samples. These results contradict the conclusion about Li-Be substitution as a predominant mechanism of Li incorporation into the beryl structure (e.g. for Cs-Li beryl: Hawthorne and Cerny, 1977). Other schemes of heterovalent substitutions involving Li should play an important role in both natural and synthetic beryl.

### References

Hawthorne FC, and Cerny P (1977) The alkali-metal positions in Cs-Li beryl. Can Mineral 15: 414-421

→

Abs. No. **589**  
Meeting: **DMG 2008**  
submitted by: **Franz, Gerhard**  
email: **gerhard.franz@tu-berlin.de**  
date: **0000-00-00**  
Req. presentation: **Poster**  
Req. session: **S08**