

Challenges and solutions on the major and trace element analysis of Eudialyte group minerals with the electron microprobe

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Alkaline complexes containing eudialyte group minerals (EGM) comprise one of the most promising sources for future rare earth element (REE) supply. The accurate quantification of the chemical composition of EGM is complicated by both mineralogical and X-ray-specific challenges. These include: 1) structural and chemical variability of EGM composition (e.g., [1-3]); 2) mutual interferences of X-ray lines from major and trace elements, in particular REEs [4]; 3) the diffusive volatility of light anions as F and Cl and cations such as K and Na; 4) particular instability of EGM under the electron beam.

A novel analytical approach has been developed to account for the above-mentioned analytical challenges. Additionally, loss on ignition and differential scanning calorimetry data has been applied to constrain the content and composition of volatiles in the EGM structure. The influence of the electron beam on the structure of EGM has been explored with Raman spectroscopy. All correction for the overlapping of X-ray lines is processed offline. For comparison a subset of samples was analysed with Laser Ablation Inductively Coupled Plasma Mass Spectrometry. The results demonstrate that the above-mentioned parameters need to be considered and carefully optimized to perform accurate quantitative analyses on the chemical composition of EGM with the electron microprobe.

[1]Johnsen et al. (2003) *Can. Mineralogist* **41** 785-794. [2] Rastsvetaeva (2007) *Kristallografiya* **52/1** 50-67. [3] Schilling et al. (2007) *Mineral. Mag.* **75** 87-115. [4] Pyle et al. (2002) *Rev. Mineral. Geochem.* **48** 337-362.