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P40 - Light element analysis and imaging using Particle Induced Gamma-ray Emission

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Spatially resolved analytical methods are important in many fields of application. One area of research is the interdisciplinary field of geometallurgy, which combines geology with extractive metallurgy to explore and exploit ore bodies and extract valuable minerals. The characterisation of the chemical composition and structure of ores and intermediate products is important for the material- and energy-efficient utilization of primary and secondary resources of minerals and metals.
Information on "mineralogical light"elements, i.e. hydrogen to fluorine, is needed over a broad concentration range from traces to major elements. These elements can be a useful resource in itself, like lithium. Besides, they provide information about the genesis of e.g. ore deposits and rocks or have a strong influence on the mechanical behaviour of rocks.
The analysis of such elements, especially at the trace level, is a challenge for many standard micro-analytical methods. Particle Induced Gamma-ray Emission has the advantage of 1) obtaining quantitative results without matrix-matched standards, 2) being non-destructive and 3) wide applicability. In addition, it can be combined with other ion beam analysis methods like Rutherford Backscattering Spectrometry and Particle Induced X-ray Emission, for which a new set-up has been developed (see the presentation of Josef Buchriegler).
The nuclear microprobe of the Helmholtz-Zentrum Dresden-Rossendorf has been upgraded with a Gamma-ray detector (HPGe) to facilitate the spatially-resolved analysis of light elements (lithium to phosphorus). This upgrade is presented in this work. Extensive calibrations have been performed. Next, the implementation of the analysis and imaging procedures are discussed. Finally, the first results of the application on mineralogical samples are shown.

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