



inSPECtor - integrated spectroscopy sensor system for laser-induced fluorescence and hyperspectral imaging

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The raw material sector demands for fast and non-invasive exploration technologies to reduce economic and ecologic costs as well as increasing public acceptance. Within the inSPECtor project, we develop an integrated spectroscopic sensor system that uses the light spectrum measured after illumination of a target as fingerprint of a sample's composition. The idea is to integrate information from two basic types of light-material interactions, light absorption used for hyperspectral imaging (HSI), and light emission used for laser-induced fluorescence (LiF) spectroscopy.

HSI has already proven successful for various mineral identification and also allows the mapping of REEs such as Nd, which may be used as pathfinder for other REEs. However, the complexity of natural samples leads to mixed spectra with masked or weak REE-related features complicating or even precluding a robust identification of many other REEs. Here, LiF spectroscopy provides a much more sensitive alternative as REEs show very distinct emission features characteristic of the f-f type electronic transitions in REE³⁺ ions, as encountered in typical REE-containing minerals.

We present the potential of both HSI and LiF, especially for REE identification and for raw material exploration. We focus on the qualitative and quantitative aspects of REE characterization in synthetic REE standards and in natural minerals and complex rocks from a range of typical REE-mineral deposits.