



1



2

## SPATIALLY RESOLVED ANALYSIS OF LIGHT ELEMENTS IN DRILL CORES

### Task

During geological exploration, drill core samples must be examined in detail to identify rock formations. These core samples can provide clues to deposits of valuable raw materials. In order to examine the materials automatically, the industry has developed drill core scanners with X-ray technology that can detect, above all, heavy elements. Laser analytics is being examined, however, to detect additional elements as well as minerals.

### Method

Laser-induced breakdown spectroscopy (LIBS) can measure almost all chemical elements, including the light elements, which are of great importance for the evaluation of rock samples. Such samples can be spatially analyzed with focused laser excitation. Fraunhofer ILT has developed a measurement process that can be set up with a compact sensor module; a second measuring system based on laser Raman spectroscopy is able to identify chemical bonds. This way, the process is able to specifically detect which individual minerals are present.

1 *Laser sensor for integration into a drill core scanner.*

2 *3D representation of the chemical composition of a drill core (© Orexplore).*

### Results

To integrate laser analysis into an existing industrial drill core scanner, Fraunhofer ILT has developed a concept to arrange the optical sensors precisely in the free installation spaces of the scanner. This allows the laser spectroscopic measurements to be performed simultaneously with the X-ray measurements. While the drill core is rotated, the sensors travel the entire length of the core to obtain a spatially resolved image of its composition.

### Applications

The combined measurement process speeds up the analysis of drill cores obtained during geological exploration and simplifies the interpretation of their composition. The geological formations at the site of investigation can, thus, be examined more efficiently for the presence of valuable raw materials or for properties such as rock stability.

The project demonstrates how compact laser spectroscopic sensors can be integrated into existing systems, thus considerably expanding their possible applications.

This project was funded by the European Institute of Innovation and Technology EIT RawMaterials under the reference number 16275.

### Contact

Dr. Volker Sturm, Ext.: -154  
volker.sturm@ilt.fraunhofer.de

Dr. Cord Fricke-Begemann, Ext.: -196  
cord.fricke-begemann@ilt.fraunhofer.de