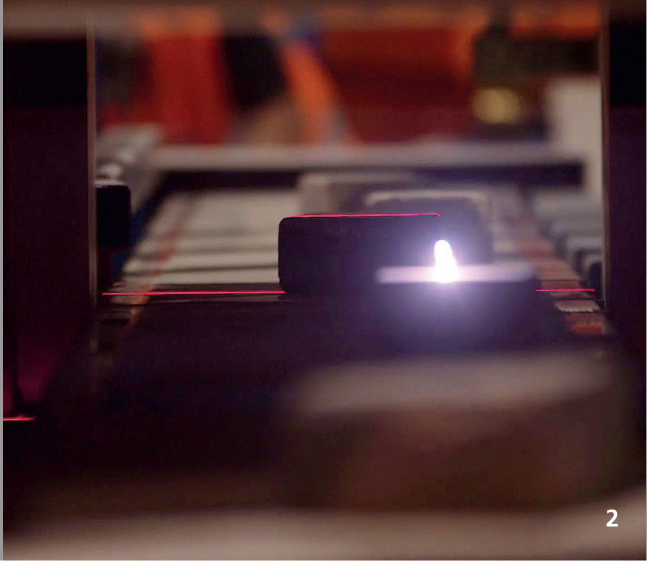

Subject to alterations in specifications and other technical information. 06/2017.

LASER-BASED DIRECT ANALYSIS OF REFRACTORY MINERALS

Task

Among mineral raw materials, refractory materials are of great importance as they are indispensable for all high temperature processes and must meet high quality requirements in order to ensure safe process control. Since, on the one hand, it is very hard to obtain primary raw materials in Europe and, on the other, considerable quantities of used material accumulate, natural resources can be protected and the generation of waste avoided with a closed material cycle.

The refractory materials used in the industry are largely based on magnesium, calcium and aluminum oxides. The exact composition determines the thermal, mechanical and chemical properties. Impurities and mixtures can quickly lead to a loss, for example of thermal stability.

Method

So that refractory materials can be reused, the recycled materials must be provided in pure fractions. This is made more difficult, however, because the material is mixed and contaminated after excavation and cannot be reliably recognized and sorted with conventional methods. To make this task feasible, project partners have developed a method for automatic sorting, which uses a laser-based direct analysis of the material. In a process combining laser ablation and laser-induced breakdown spectroscopy (LIBS), contaminants near the surface are locally removed and the underlying refractory material is identified on the basis of its chemical composition.

1 Development of an automated material handling for refractory bricks.

2 Laser-based material recognition.

Results

Together with European partners, Fraunhofer ILT has set up a demonstrator to validate the function of the entire sorting process, including identification. The system was presented to a specialist public audience; it has already been used to recover 30 tons of purely fractionated material. The recycled material replaced a portion of new material in production, and partners could demonstrate in industrial tests that this mixture has the same quality as refractories produced from pure primary raw materials.

Applications

The automatic sorting with LIBS is able to separate raw materials into pure fractions in the primary and recycling sectors, where substances have to be identified by means of a fast multi-element analysis. Also in the metal industry, for example in aluminum recycling, laser-based direct analysis can distinguish between individual alloys, thus making closed raw material cycles possible.

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Contact

Dr. Cord Fricke-Begemann
Telephone +49 241 8906-196
cord.fricke-begemann@ilt.fraunhofer.de

Prof. Reinhard Noll
Telephone +49 241 8906-138
reinhard.noll@ilt.fraunhofer.de

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
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