



MATERIAL DETECTION FOR THE RECYCLING OF REFRACTORY MATERIALS

Task

Refractory materials are an essential element in all high-temperature processes and constitute a substantial global market. By recycling refractories, the industry can tap a great potential to prevent the generation of waste and to reduce the consumption of primary raw materials. Due to different thermal, chemical and mechanical stress, a variety of materials – primarily based on aluminum, calcium and magnesium oxides – are used in the processes. To ensure high-quality recycling and reuse of refractory materials, the various types need to be efficiently separated on the basis of their chemical composition.

Method

Together with European partners, technology is being developed to automatically sort refractory materials from steel production without crushing them. For the direct chemical analysis, the method of laser-induced breakdown spectroscopy (LIBS) is used to individually examine all refractory bricks with masses which can exceed 10 kg and to place them into the associated material category in the sorting machine.

Result

Thanks to the LIBS measurements, the main components of the materials can be directly identified for an initial screening stage. Further additives are also recognized so that it is possible to divide the materials into a large number of sub-classes. The LIBS measurements are done in less than a second and use a series of laser pulses in order to obtain representative results of the bulk material, even when surfaces are contaminated. The work in the project has shown that this identification is not possible with other measurement techniques under industrial requirements.

Applications

A LIBS-based sorting is particularly suited for differentiation and classification of different refractory materials in the shortest possible time by means of multi-element analysis. The method may be used also for other minerals and oxide materials.

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3 Various refractory materials.

4 Laser-direct analysis of a refractory brick.