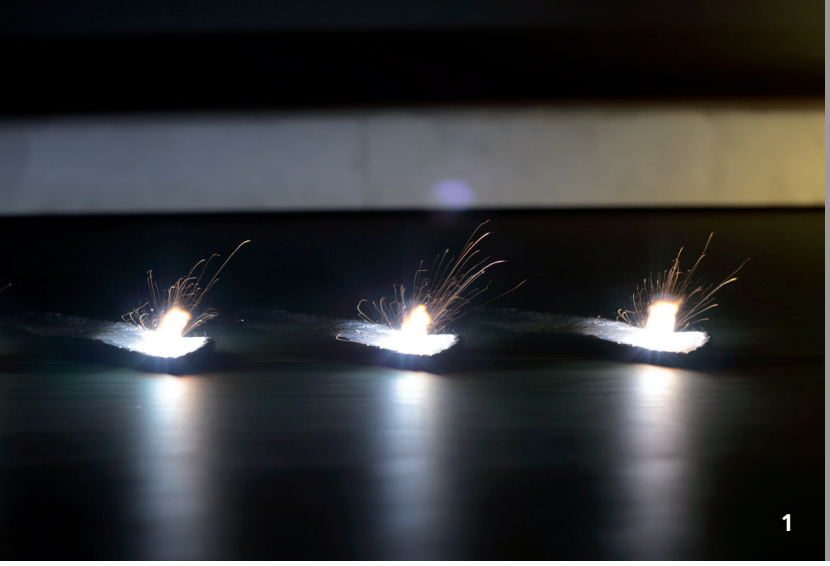

SORTING ALUMINUM ALLOYS WITH LASER ANALYSIS

Task

Manufacturing aluminum from primary raw materials uses several times more energy than melting scrap metal. This makes recycling a compelling option for both economic and environmental reasons. Aluminum is used in a wide range of alloys. If an undefined mixture of these alloys is melted, heavy »dilution« with pure primary aluminum tends to be then required in order to meet the specifications for manufacturing a certain material. Extracting low-alloy aluminum directly from secondary raw materials, however, requires efficient material sorting.

Method

In collaboration with Tomra Sorting Solutions a transportable demonstrator was developed that addresses the entire process chain, right from depositing the pieces of scrap to be recycled through to discharge, see Fig. 1. Individual pieces of scrap are transported on a conveyor belt at a speed of 3 m/s. 3D object recognition determines the position of each piece on the belt. A pulsed laser beam is focused on the pieces, vaporizes a small quantity of the material and transforms this into a plasma. The light emitted by the plasma is routed by an optical waveguide to a spectrometer, see Fig. 2. Laser-induced breakdown spectroscopy (LIBS) classifies the pieces of scrap into up to four fractions in real time. Depending on the size of the individual pieces, the throughput rate is up to 4 t/h.

1 Time exposure over 3 measurements.

2 PARILAS demonstrator.

Result

Quantitative laser analysis of each individual piece is possible with production scrap. Test batches including production samples from eight commercially available aluminum wrought alloys are identified with a high degree of accuracy. A processing technique for a mixed set of samples including approx. 200 pieces of shredder scrap made of various aluminum wrought alloys was also studied. The aim was to determine how high-grade 3xxx and 6xxx compatible fractions can be extracted from a single mixed set of samples.

Applications

Sorting by laser analysis classifies various metals on the basis of multi-element analysis. This enables various metals such as steel, brass, zinc and titanium to be separated and individual alloys to be precisely differentiated.

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