Scanning LIBS measurements for the detection of element distributions in used mobile phones

Sustainably recycling electronics at the end of their useful life remains an unresolved problem for the circular economy sector. While copper and precious metals are already largely recovered from printed circuit boards, many other components are lost, including technology metals such as tantalum, tungsten and rare earth elements. These give electronic components their high performance and specific functionality, but only make up a small proportion of the total mass of electronic waste. In order for industry to recover these valuable materials, they must be specifically removed from the circuit boards. Unfortunately, the information required for this will not be available from manufacturers for the foreseeable future. Although mobile phones are only used for a few years, they are then stored at home for a long time until they are finally disposed of. As a result, mainly devices between 10 and 25 years old are recycled.

Digital twin for material recycling

To enable the targeted removal and recycling of electronic components, Fraunhofer ILT has developed a process that measures the chemical composition of the components in their installed state. When combined with other information relevant for recycling, this process creates a digital twin for each device model, which provides the data required for automated mechanical processing of the old devices.

LIBS reveals the ingredients inside

The circuit boards are examined point by point and component by component using the scanning laser-induced breakdown spectroscopy (LIBS) system developed at Fraunhofer ILT. At each position, a multi-element analysis is carried out in fractions of a second, the results of which are combined to form element maps for each metal. The laser not only examines the material on the surface, but also penetrates so deeply into the components that internal structures and elements are also captured by the measurements.

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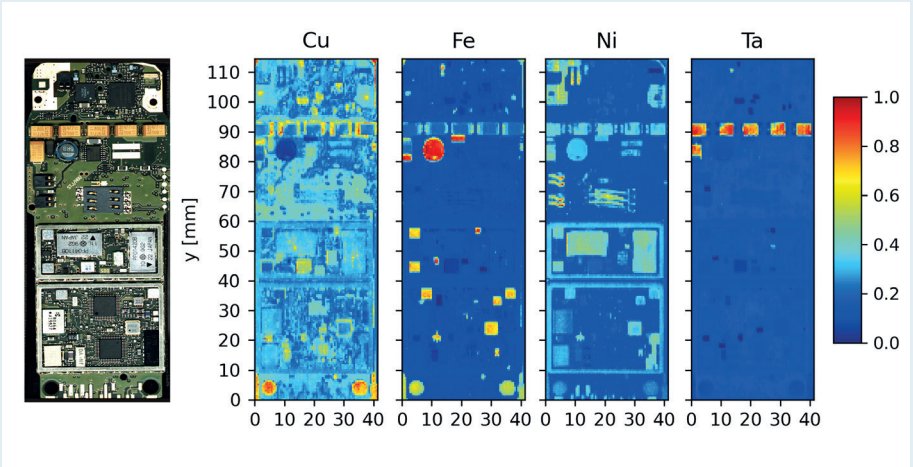

1 Element maps of a mobile phone board measured with LIBS.