# LIBS as a Tool for Transforming E-Waste into Valuable Resources

## Challenges

In the age of rapid technological advancement, electronic waste (e-waste) is becoming a growing concern, both environmentally and economically. While millions of tons of e-waste are discarded each year, much of it contains valuable resources like **gold, silver, copper, and rare earth elements** that could be recycled and reused. Traditional methods of extracting these materials are often inefficient, costly, and harmful to the environment.

## Solution

With **LIBS** ability to detect a wide range of elements, **Sci-trace** and **M-trace instruments** prove to be the right tool to help alleviate environmental sustainability challenges. As we continue to refine and expand the use of this technology, its role in supporting efficient and eco-friendly recycling processes will undoubtedly become even more critical. **LIBS** addresses the pressing need for sustainable resource management and paves the way for a greener future. Quantifying metal concentrations in e-waste using **LIBS** will be the next step towards enabling efficient metal recovery processes. This will not only help to conserve natural resources but also significantly reduce the environmental footprint associated with traditional mining and processing of raw materials. By **recovering metals from e-waste**, the demand for virgin materials can be decreased, thereby lessening the ecological impact and fostering a more sustainable approach to resource management.

## Results

In the analysis of various metal samples, the **Sci-Trace** device was used to detect Copper (**Cu**) and Nickel (**Ni**) in nearly all samples. Significant amounts of Tin (**Sn**) and Silver (**Ag**) were also found in many samples, along with smaller quantities of Gold (**Au**). The analysis extended to electrolytes, where Nickel (**Ni**), Copper (**Cu**), Silver (**Ag**), and Magnesium (**Mg**) were predominantly identified. The presence of these metals is noteworthy, as they are commonly used in electronic components and hold high recycling value.

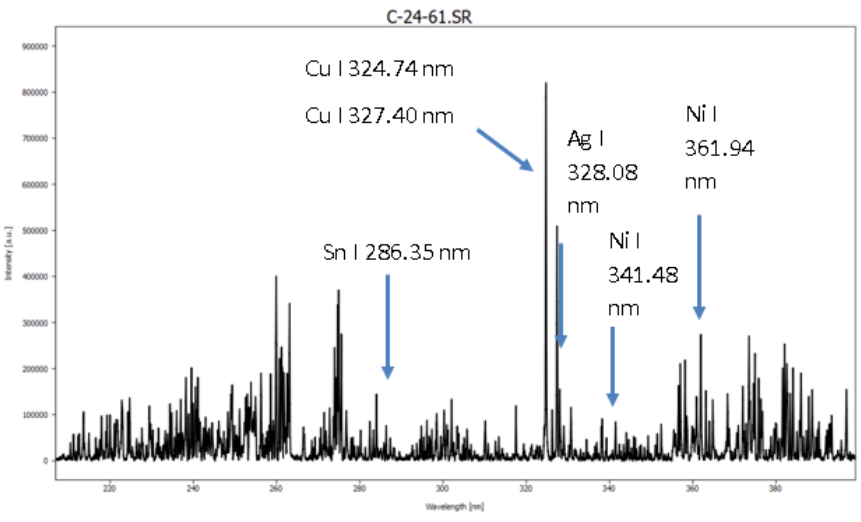


**Figure 1: Composition of a metal sample**

 

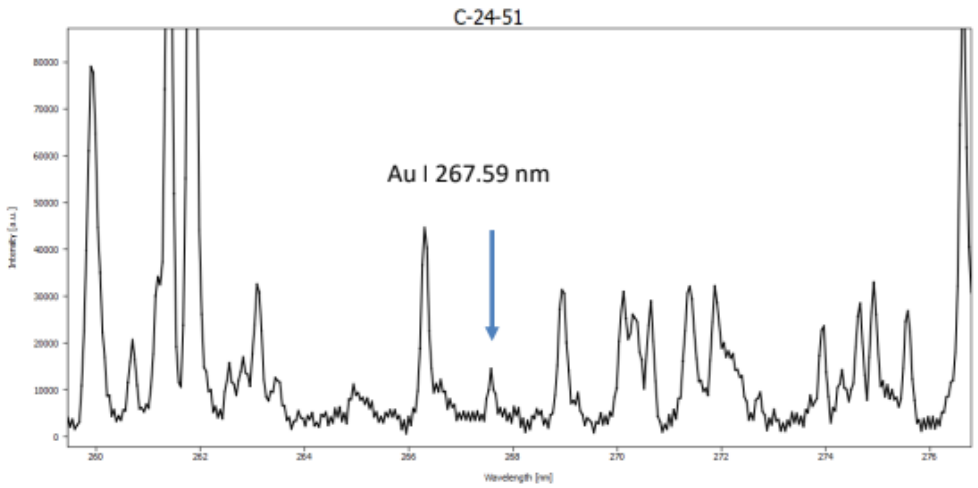


**Figure 2: Composition of a metal sample**

**Figure 3: Electronic waste**


**Figure 4: Measured samples of electronic waste**

# LIBS Principles

**Laser Induced Breakdown Spectroscopy (LIBS)** is an optical emission tool for the quick characterization of chemical elements in a broad range of materials, including biological, geological, and ceramic materials. A highly energetic laser pulse is directed at the target sample (Figure 5), resulting in the creation of an expanding microplasma upon impact. This microplasma emits luminous species that provide valuable information about the material composition and the sample environment.

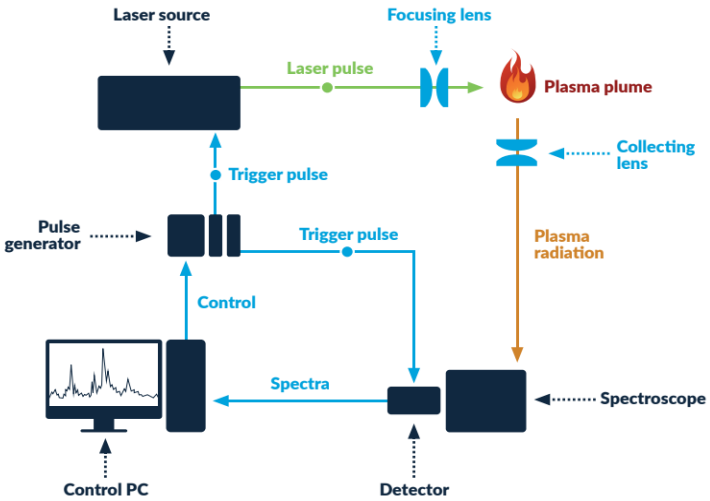


**Figure 5: Sci-Trace LIBS set-up scheme**

 