LIBS Technology: Precise Detection of Antimony and Harmful Substances in PVC

Challenges

The growing demand for sustainability and stricter environmental regulations pose a significant challenge in controlling the composition of polyvinyl chloride (PVC). As a widely used polymer in construction, packaging, and consumer goods, PVC often contains various additives and potential contaminants that must be precisely monitored. Ensuring compliance, safety, and material quality requires advanced analytical approaches capable of providing fast and accurate insights into its composition.

Solution

Leveraging LIBS technology enables the accurate detection and quantification of PVC components. **Sci-Trace** has been successfully applied to directly measure antimony (Sb) levels in PVC. Historically, antimony oxide was incorporated into PVC as a flame retardant; however, its concentration can reach up to 5%, raising concerns about toxicity and environmental impact. By applying **LIBS technology**, it is possible to detect antimony in PVC samples with high accuracy, providing critical data for compliance monitoring, quality control, and safer material management.

Results

Figure 1: PVC samples

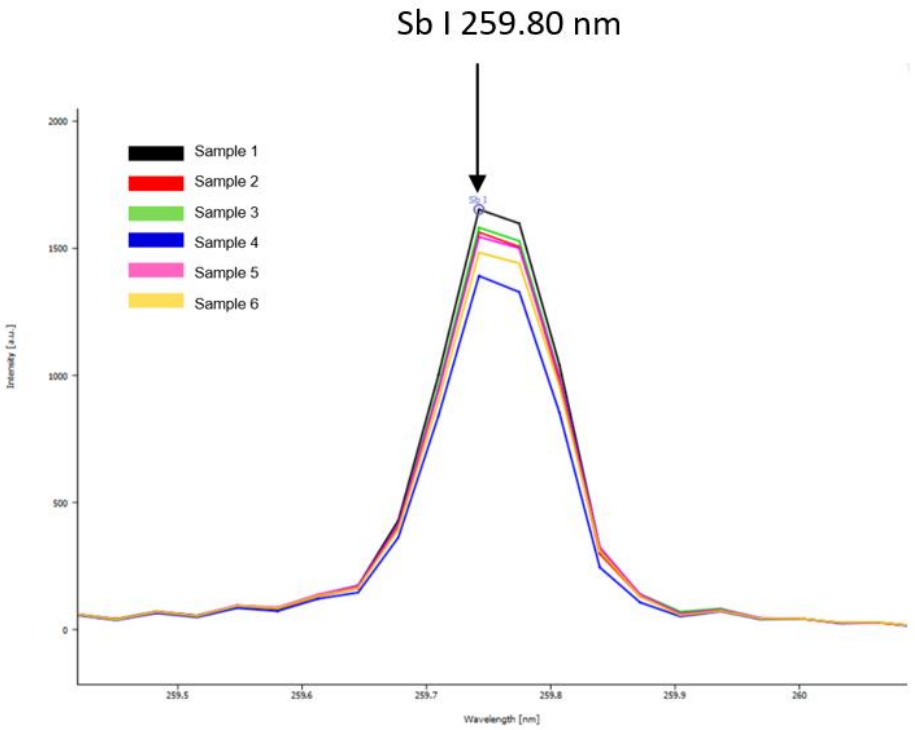

Figure 1: Detection of Sb in PVC samples

The composition of **PVC** can be comprehensively analyzed through continuous in-line measurements, which offers a distinct advantage over methods such as **hand-held LIBS,** by enabling real-time monitoring directly on the production line, ensuring accurate and efficient quality control.

These results showcase our capability to tackle even the most challenging analytical demands, delivering the data needed to understand and monitor the presence of potentially harmful substances. By demonstrating the ability to measure these critical elements with precision and efficiency, **our LIBS technology** sets a new standard for material analysis, equipping industries with the tools needed to align with regulatory requirements, prioritize sustainability, and innovate for the future.

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 4), 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.

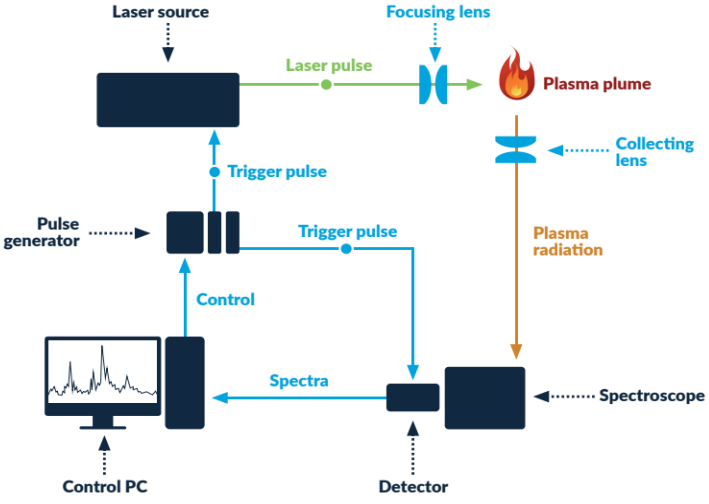

Figure 4: Sci-Trace LIBS set-up scheme