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Advances in applications of mass spectrometry (ToF-SIMS, LA-ICP-ToF-MS) for forensic analysis

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Mass spectrometry techniques, ToF-SIMS (time-of-flight secondary mass spectrometry) and LA-ICP-ToF-MS (laser ablation inductively coupled plasma time-of-flight mass spectrometry), are promising and very attractive tools in solving many important problems of forensic sciences. Surface imaging, the possibility of a reliable identification of substances on the surface with great analytical sensitivity and low detection limits allow one to discriminate samples found as evidence in different criminal cases. ToF-SIMS can be a powerful tool in chemical investigations of fingerprints left on different surfaces and polluted by traces of exogenous substances (e.g. traces of drugs, gunshot residues-GSR) which do not exist in natural excretion. This method makes it possible to characterize traces of substances transferred from the suspect's finger or from the object (e.g. glass, mug, table, mobile phone) using special secondary basis like professional dactyloscopy tapes. It may be potentially applied in characterization of tobacco samples, drugs, inks and documents. Examinations using LA-ICP-ToF-MS proved that it can be potentially used for an elemental characterization of toners, inks, papers, gunshot residues, fragments of automotive paints, samples of hair and bones. The above mentioned methods can successfully complement conventional techniques used for forensic studies as they play a significant role in providing information on the chemical components and surface visualization of forensic traces.

Biography

Małgorzata Iwona Szyńska completed her PhD in 1999 at Lodz University of Technology, Poland; DSc in 2008, and she was a Full Professor in 2016. Her scientific and research fields include "The applications of modern techniques (ToF-SIMS, SEM-EDS, ICP-OES, ICP-MS, LA-ICP-ToF-MS, AAS) in forensic chemistry, trace elements analysis (mainly environmental protection) and heterogeneous catalysis". From 2016, she is a Dean of the Faculty of chemistry in Lodz University of Technology, Poland. She has published over 100 papers, including more than 80 papers in reputed journals and 20 invited book chapters. She has been a Head or main Investigator of almost 20 scientific projects.

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