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name of the unit: LABORATORY OF SURFACE AND TRACE ANALYSIS Institute of General and Ecological Chemistry, Lodz University of Technology		symbol: I-31 http://www.ichoie.p.lodz.pl
head of the unit: Prof. Małgorzata Iwona Szynkowska- Jóźwik, PhD, DSc	potential promoters: Prof. Małgorzata Iwona Szynkowska- Jóźwik, PhD, DSc Jacek Rogowski, PhD, DSc, Prof. TUL Elżbieta Maćkiewicz, PhD Aleksandra Pawlaczyk, PhD	contact person: Prof. Małgorzata Iwona Szynkowska-Jóźwik, PhD, DSc phone: 48-42-631-31-00 malgorzata.szynkowska@p.lodz.pl
scope of activities: <ul style="list-style-type: none">Application of modern analytical techniques (ToF-SIMS, SEM-EDS, LIBS, ICP-OES, ICP MS, LA-ICP-MS, AAS) in the field of trace elemental and molecular analysis.Development of new measurement and sample preparation procedures (sample digestion and analysis) in order to help solve problems in many real case scenarios in the area of forensic chemistry (e.g. examination of documents, crossing lines and aging issues, visualization, enhancement and discrimination of selected forensic traces) and in analytical chemistry (design and optimization of protocols dedicated to the analysis of wide range of materials).		<p>The diagram shows a workflow starting with a 'sample' (represented by a grid of orange dots). An arrow points to 'surface analysis', which is depicted with a red laser beam hitting a surface and a computer monitor displaying a graph. Another arrow points from the 'sample' to 'analysis of extracted/decomposed material', which is shown as a blue liquid in a test tube being analyzed by a green instrument, with a computer monitor displaying a graph below it.</p>
present activities: <ul style="list-style-type: none">Gaining quantitative or semi-quantitative information about the tested samples and comparing the results acquired by various analytical techniques.Imaging the presence of selected components on the surface of solid samples using LIBS, SEM-EDS, ToF-SIMS techniques and combining the results for selected layers within tested material.		
Future activities: <p>Development and optimization of chemometric models allowing the performance of multivariate data analysis in the field of discrimination and classification of studied samples based on selected criteria such as their origin. In the future the emphasis will be put on the imaging technologies enabling the visualization of multi-dimensional and multi-parameter data.</p>		
Publications/patents, awards, projects: <ol style="list-style-type: none">Szynkowska-Jóźwik, M.I.; Maćkiewicz, E.; Rogowski, J.; Gajek, M.; Pawlaczyk, A.; de Puit, M.; Parczewski, A. Visualisation of Amphetamine Contamination in Fingerprints Using TOF-SIMS Technique. <i>Materials</i> 2021, 14, 6243.Gajek, M.; Pawlaczyk, A.; Szynkowska-Jozwik, M.I. Multi-Elemental Analysis of Wine Samples in Relation to Their Type, Origin, and Grape Variety. <i>Molecules</i> 2021, 26, 214.Pawlaczyk, A.; Gajek, M.; Balcerak M.; Szynkowska-Jozwik, Determination of metallic impurities by ICP-MS technique in eyeshadows purchased in Poland. Part I, <i>Molecules</i> 2021, 26(21), 6753.Szynkowska, M.I., Pawlaczyk, A., Maćkiewicz, E. Bioaccumulation and Biomagnification of Trace Elements in the Environment 2018; <i>Recent Advances in Trace Elements</i>, Wiley.Pawlaczyk, A., Maćkiewicz, E., Szynkowska, M.I., Speciation of Trace Elements and its Importance in Environmental and Biomedical Sciences 2018; <i>Recent Advances in Trace Elements</i>, Wiley. Patents: <ul style="list-style-type: none">Jóźwik K., Kryłowicz W., Podsekowski L., Magiera R., Obidowski D., Reorowicz P., Sobczak K., Szynkowska M., Wróblewski P., Method for mercury capture from gases forming in the energy combustion of coal, EP3181213A1.Kula P., Pietrasik R., Szynkowska M.I., Leśniewska E., Góralski J., Niedzielski P., Albińska J., Szafran S., Maniecki T., Multilayer composite to a reversible sorption of mercury and a method for sorption and desorption of mercury from the gas phase, EP2916930A1, US2015283496A1, WO2014073996A1.		



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Recently, we have completed the following projects:

- The development of innovative and cost-effective technology for reduction of mercury atmosphere emission from coal combustion
- Development of heterogeneous catalysts for oxidation of odorous compounds
- Multi-Modal Imaging of Forensic Science Evidence
- Development of modified bonding systems and composite materials for dentistry with the addition of nanosilver and nanogold and determination of their antibacterial properties
- Single-module mobile installation for the production and processing of furfural in the place where bio-waste is generated

Keywords:

trace analysis, surface analysis, forensic analysis, heavy metals, elemental analysis, environmental protection, monitoring, bioindicators, safety assessment, catalysis, modern analytical techniques, ICP-MS, ICP-OES, AAS, ToF-SIMS, SEM-EDS, LA-ICP-MS, LIBS

List of internship proposal in this research team:

- Co-operation in forensic evidence analysis (e.g. paper substrate, inks, toners, fingermarks and fingerprints, soil, glass, GSR)
- Co-operation in trace elemental analysis of environmental (soil, waste water, air, fly ash), cosmetics (eye shadows, nail polishes, foundations, lipsticks) and biological (bioindicators, food, human hair) samples