

Laser ablation inductively coupled plasma MS as a tool for elemental mapping

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Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) is becoming very favorite technique for direct solid sample analysis in analytical chemistry. At present, it represents one of the most sensitive techniques for the imaging of metals, metalloids (Se) and nonmetals (P, S, C). Imaging of these elements was applied to a wide range of biological samples (brain slices, plant tissues, bones, teeth...). The major advantages of this technology are no or little sample preparation, possibility of minor and trace element analysis, high sensitivity and impressive lateral resolution which enable detection of small material defects. LA-ICP-MS and electron probe micro-analysis (EPMA) were applied to mapping of lateral elemental distribution of corroded samples. Data obtained by these two methods were compared statistically. Elemental imaging of tapeworm cuts and accumulation of Pb in the tissues will be discussed also.

I) Candidate structural materials for a nuclear reactor cooling circuit

Molten LiF-NaF, LiF-NaF-ZrF₄ salts are examined as a cooling medium in Molten Salts Reactor system (MSR). This new type of nuclear power plant provides greater safety and economic of whole system. The structural materials need to be resistant to high temperatures (~500°C) and extremely corrosive environment, which molten fluoride salts represent.

Different types of structural materials were examined (pure Ni, Ni based alloys, pure Fe with Ni-coating). Tested materials were exposed to molten fluoride salt treatment at temperature of 680°C. Parts of studied materials were cut out, polished by diamond paste and embedded into epoxy resin. The material corrosion changes were studied by mapping the sections of sample walls.

Quantification procedure with external calibration standards is not possible in case of corroded sample due to different ablation rate, hence normalization method which uses a total sum of signals of isotopes was employed. Fluorine signal was calculated from stoichiometry of fluoride salts and Na, Li, Zr counts. Thickness

of affected surface was determined and created 2D maps show constituent elements decrease (in case of Li, Na, Zr increase) in the sample (i.e. corrosion). Penetration of molten salts into specimen material was proved.

II) Tapeworm tissues

Small terrestrial rodents have been used in the monitoring of environmental pollution by heavy metals for a long time. Certain parasites are able to accumulate considerable concentration of some elements more effectively than the host tissues. Bioaccumulation of heavy metals (Pb, Zn, Cu) in tapeworm *Hymenolepis diminuta* was studied. Laboratory rats *Rattus norvegicus* were infected and their diet was supplemented with $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$. The tapeworm strobilae were separated and analyzed by means of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). Optimization of laser ablation parameters (repetition rate, fluence, laser spot diameter, scan speed) was performed. Under optimized conditions the tapeworm cuts were analyzed and elemental maps were created.

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