SAMPLE ANALYSIS BY LASER SPECTROSCOPY, ICP-MS, RIMS AND INAA

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Among the modern analytical methods, laser spectroscopy, Instrumental Neutron Activation Analysis (INAA) and mass spectrometry are the leading techniques for the detection of trace amounts of different isotopes in complex matrices providing the breadth of information about the elemental and isotope composition [1–7]. Combination of the INAA, Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and laser spectroscopy (TRLIF, TRLIC, RIMS) may be very efficient both for element and isotope composition analysis of the samples. We report on chemiluminescence of plutonium, uranium, and samarium in solutions. The details of multi-step excitation of species and time-resolved detection of resulting luminescence (TRLIF) and chemiluminescence (TRLIC) are considered. In the next step, we combine the atomic laser spectroscopy with mass spectrometry detection (RIMS). The trace amount detection has been demonstrated for Kr isotopes (including ^{81}Kr) of radiogenic (nuclear power plants) and cosmogenic (meteorites and other extra-terrestrial material) origin [3,4]. Several multi-step RIMS approaches have been extended to uranium and other radioisotopes from solid and liquid samples [3,4]. We have applied both INAA and ICP-MS methods and analysed the elemental composition (64 elements) of bones of dinosaurs, South mammoths, prehistoric bear and archanthropus as well as the samples of surrounding soils; everything collected in different parts of Uzbekistan [5,7]. A high concentration of uranium we detected in the bones of dinosaurs (122 mg/kg), South mammoth (220 mg/kg), prehistoric bear (24 mg/kg) and archanthropus (1.5 mg/kg) compared to surrounding soils (3.7–7.8 mg/kg) and standard bones (<0.01 mg/kg) is a bit of a puzzle [7]. We plan to solve this puzzle by measuring the isotopic composition of the samples. Some results of isotopic composition measurements will be presented.

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