

# Nuclear analytical techniques used to study bottom sediments

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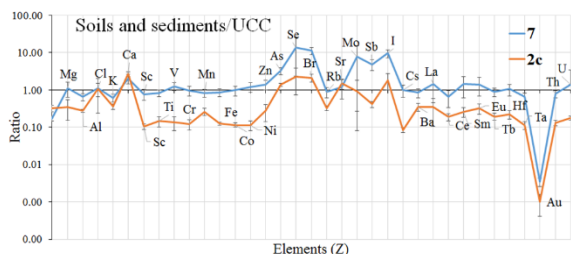
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**Introduction:** Comprehensive elemental analysis and radionuclide content of bottom sediments is necessary to assess the significance and fate of absorbed pollutants. In spite of many other analytical techniques, reactor activation with epithermal neutrons is continuing to be most powerful method of multi-element determination with high precision and accuracy [1]. High-resolution gamma-spectrometry is a non-alternative technique for tracing natural and man-made radionuclides [2]. Long-term experience in applying instrumental epithermal neutron activation analysis for elemental determination in bottom sediments in aquatic ecosystems in various parts of the world, as well as gamma-spectrometry of radionuclides is described.

**Methods:** ENAA of bottom sediments (for example, [3-5]) was carried out at the reactor IBR-2 of the FLNP JINR, Dubna, Russia [6]. Gamma-spectrometry of <sup>137</sup>Cs and other radionuclides was carried out in the Bucharest University, Romania, as described elsewhere [7].

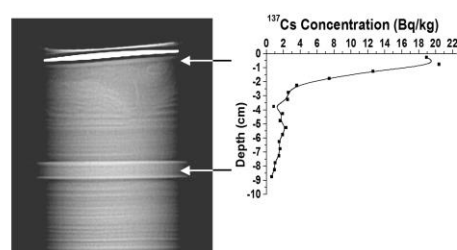
**Results:** Example of ENAA of bottom sediments is given in **Fig. 1** (the IAEA Project on Identification of Data Gaps in the Adriatic and the Black Sea and



**Fig. 1:** Elemental content in soils and sediments normalized on UCC for two stations in the study area of the Russian Black Sea coastline [3].

Harmonization of Field Sampling Strategies for Strengthening Regional Capacities in Coastal Management (RER/7/009 -1802161)). Radionuclide determination in the bottom sediment core collected

at the depth of 600 m of the Romanian Black Sea coastline is demonstrated in **Fig. 2**.



**Fig. 2:** Vertical profile of the anthropogenic <sup>137</sup>Cs showed two maxima, the upper one attributed to Chernobyl, the lower one corresponds to nuclear weapon tests in the 60es of the XX century [2].

Efficient use of nuclear and related analytical techniques makes them an important instrument for the environmental studies and bottom sediments, in particular.

**References:** [1] Frontasyeva, Steinnes (1997) IAEA Proceedings series; ISBN 92-0-103697-3:301-311; [2] Cristache et al. (2009) *Applied Radiation and Isotopes* **67**(5):901-906; [3] Nekhoroshkov et al. (2017) *American Journal of Analytical Chemistry* **8**(04):225-244; [4] Badawy et al. (2017) *Journal of African Earth Sciences* **131**: 53-61; [5] Baljinnyam, et al. (2014) *Letters to PEPAN* **11**, 2(186):324-337; [6] Frontasyeva. Neutron activation analysis for the Life Sciences. A review (2011) *PEPAN* **42**(2):332-378; [7] Florea et al. (2011) *Geochronometria* **38**(2):101-106.