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INVITED LECTURE - Radiochemical neutron activation analysis: the continuous need of this analysis mode

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Attempts are being made to replace radiochemical neutron activation analysis (RNAA) by other analytical techniques capable of low-level element determination, such as various modes of atomic absorption spectrometry (AAS) for single-element determination, various modes of mass spectrometry, especially inductively coupled plasma mass spectrometry (ICP-MS) for multielemental analysis and/or by accelerator mass spectrometry (AMS) for long-lived radionuclides. The reason is that that the use RNAA is associated with a higher workload and radiation burden for personnel compared with non-destructive, instrumental neutron activation analysis (INAA), and sometimes also with the use of chemicals that are considered to be not environmental friendly (e.g., organic solvents). However, RNAA remains to be a method of choice, especially for low-level, low-uncertainty determination of selected elements, and in selected applications. The continuous need of RNAA has been accentuated by a recent recognition of neutron activation analysis (NAA) as primary method of measurement [1], disregarding whether INAA or RNAA is employed. It has been demonstrated that RNAA is the most powerful means of optimization of NAA in terms of achieving the lowest element detection limits and uncertainty of measurement [2,3]. Examples are presented of superior low-level determination of, e.g., silicon, vanadium, manganese, nickel, selenium, iodine, rhenium, mercury in biological materials and determination of REE in geochemical and cosmochemical samples by RNAA. The major application fields involve biomedicine, agriculture, and chemometry, namely certification of reference materials. Recent trends and achievements in RNAA are also briefly mentioned, e.g., a fast decomposition of biological materials by alkaline-oxidative fusion, new and/or amended separation methods, such as replacement of liquid-liquid extraction by solid phase extraction, use of nanoparticles, and use of "green"chemistry in separation of elements and their radionuclides.

References

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