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Development and application of method for determination of 89,90Sr in environmental samples by the use of NaOH for separation of strontium from calcium

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The method allows cheap, safe and reliable determination of 89Sr and 90Sr in major environmental materials in sizeable quantities –water (500 L), soil (1000 g), milk (20 L), grass (1000 g), bone (1000 g), etc., routinely or in emergency situations (nuclear power plant accidents, "dirty"bombs, nuclear weapons detonation, etc.). Radiostrontium is leached by aqua regia from the ashes of the solid samples (burned at 5500C) or it is preconcentrated from the liquid samples by carbonate precipitation. The separation of strontium from the large quantities of calcium is atained by the use of NaOH –under heating or at room temperatures. Due to difference of solubility of strontium and calcium hydroxides in diluted alkaline solution (0.2-0.3M NaOH) calcium hydroxide can be precipitated while strontium hydroxide remains in the solution. When both 89Sr and 90Sr should be reported radiostrontium is separated from the isotopes of barium/radium/lead by precipitation of the latter as chlorides in hydrochloric acid. Otherwise when only 90Sr is expected to be present in the samples then separation (after ingrowth) of its daughter nuclide 90Y (from 90Sr and isotopes of barium/radium/lead) is carried out in sulfate and ammonium hydroxide media. Measurements are performed by liquid-scintillation spectrometer in Cherenkov mode (without scintillation cocktail) of purified 89,90Sr or purified 90Y. Chemical yields of strontium and yttrium is measured respectively by gamma-spectrometry (of 85Sr-tracer) and by titration (of stable yttrium carrier). The critical steps in the method were examined which resulted in reproducible chemical yields in the range 75 –95%. The method has been used routinely at 2 laboratories in Bulgaria for analyses of more than 1000 samples in the last 7 years. The analytical quality was checked by analyzing reference materials with different matrices and regular participations in international intercomparisons.

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