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Semi-automated Procedure for Rapid Determination of 90Sr in Water Samples by Cherenkov Counting

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Radiostrontium as a high yield fission product with long physical (28.8 years) and biological half-life (~49 years), is one of the most hazardous radiocontaminants in the environment. Therefore, almost all environmental radioactivity monitoring programs include its quantitative determination. Due to its radiochemical properties standard procedure for its determination is complicated and time consuming. Consequently, so called rapid methods for its separation and determination are being rapidly developed [1-4]. However, there is a lack of prompt and reliable methods for determination of low level activities in the environmental samples. Hence, in this paper, method for rapid low level activity determination which includes simultaneous selective binding of 90Sr and 90Y on chromatographic column filed with mixture of DGA-SuperLig resins and subsequent on column Cherenkov detection will be presented. Highly selective strontium binding on SuperLig 620 and yttrium on DGA resin are based on molecular recognition [5,6] and enable their selective and quatitative binding with almost 100% recovery. If one assume that in the sample 90Sr is in equilibrium with its daughter 90Y, mixture of SuperLig 620 and DGA resin might enable rapid selective separation of 90Sr and 90Y from matrices and direct on column Cherenkov counting. Therefore, method consist of automated sample delivery to the column filled with DGA/SuperLig resins and 90Sr-90Y Cherenkov counting on low level counter, TriCarb 3180 TR/SL. Sample is delivered to the column at constant flow rate until the breakthrough point and 90Sr via 90Y was determined by counting column in PE vial surrounded with 5 M HNO3 to achieve higher efficiency determination. Thereby, to develop this method, best mixing options using different media were examined as well as breakthrough curves for strontium and yttrium in 0.5M HNO3 were determined. The new method significantly reduces time and human labor for determination of radioactive strontium in water samples. It was validated with proficiency testing water samples as well as natural water samples.

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