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Detecting low levels of radioactive Sr in environmental samples using RPQ-TIMS

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In some environments, such as sites that have experienced radioactive contamination from nuclear accidents or weapons testing, radioactive strontium (^{90}Sr; half-life of 28.8 years) can be found. The monitoring of ^{90}Sr is important from a human perspective because when contaminated food or water is ingested, ^{90}Sr is concentrated primarily in bones and bone marrow, resulting in bone cancer, cancer of nearby tissues and leukemia. Typically, the abundance of ^{90}Sr has been measured using radiometric techniques, such as solid/liquid scintillators or gas ionization detectors. The major disadvantage of this technique is the total analysis time (5-20 days)[1]. In recent years, thermal ionization mass spectrometry has provided a means to dramatically reduce analysis time, improving sample through-put to 10-15 samples/day [2], [3]. However, the peak tailing from the highly abundant ^{88}Sr has limited the ability of conventional mass spectrometry to be able to resolve less radioactive samples. Here, we demonstrate the ability of the Retarding Quadrupole Lenses (RPQ) of the Thermo Scientific™ Triton™ Series TIMS to precisely and accurately measure ^{90}Sr/^{88}Sr ratios as low as 9.1×10^{-12} [4]. This allows the measurement of low activity environmental samples from the vicinity of the Chernobyl and Fuskishima nuclear disasters with a modern ^{90}Sr activities ranging between 14.8 and 110 Bq/kg.

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