

September 2014 Update: EPA has validated and published a rapid method for building material matrices for analysis of strontium-89 and strontium-90. The method is summarized and accessible through the link provided below.

Rapid Radiochemical Method for Total Radiostrontium (Sr-90) In Building Materials for Environmental Remediation Following Radiological Incidents

Analyte(s)	CAS RN
Strontium-89	14158-27-1
Strontium-90	10098-97-2

Analysis Purpose: Qualitative analysis

Technique: Beta counting

Method Developed for: Strontium-89 and strontium-90 in building materials

Method Selected for: SAM lists this method for qualitative analysis of strontium-89 and strontium-90 in concrete or brick building materials

Description of Method: Strontium is collected and purified from concrete or brick matrix samples using sodium hydroxide fusion, and purified from potentially interfering radionuclides and matrix constituents using a strontium-specific, rapid chemical separation method. The sample is equilibrated with strontium carrier, and preconcentrated by strontium/calcium carbonate coprecipitation from the alkaline fusion matrix. The carbonate precipitate is dissolved in hydrochloric acid and strontium is precipitated with calcium fluoride to remove silicates. The strontium fluoride precipitate is dissolved in strong nitric acid and the solution is passed through a Sr Resin extraction chromatography column. The sample test source is promptly counted on a gas flow proportional counter to determine the beta emission rate, which is used to calculate the total radiostrontium activity. The method is capable of satisfying a method uncertainty for strontium-90 (total strontium-90) of 0.31 pCi/g at an analytical action level of 2.4 pCi/g. To attain the stated measurement quality objectives (MQOs), a sample weight of 1.5 g and a count time of approximately 1.5 hours are recommended.

If differentiating between strontium-89 and strontium-90 is needed, then the same prepared sample can be recounted after ~10 days. If the initial and second counts agree (based on the expected ingrowth of yttrium-90) then strontium-89 is not present in significant amounts relative to strontium-90. Computational methods are available for resolving the concentration of strontium-89 and strontium-90 from two sequential counts of the sample (see Appendix B of the method). If significant amounts of strontium-89 are suspected, it can be determined more rapidly using Cerenkov counting; however, the minimum detectable activity levels will be higher than that of determination with gas proportional counting and may or may not meet measurement quality objectives.

Special Considerations: Count results should be monitored for detectable alpha activity and appropriate corrective actions should be taken when observed. Failure to address the presence of alpha emitters in the sample test source may lead to high bias in the results, due to alpha-to-beta crosstalk.

Elevated levels of radioisotopes of tetravalent plutonium, neptunium, cerium, and ruthenium in the sample may hold up on the column and co-elute with strontium. The method employs an oxalic acid rinse that should address low to moderate levels of these interferences. Significant levels of strontium-90 will interfere with the total radiostrontium analysis (see Appendix B of the method for an alternative approach should this situation arise). High levels of lead-210 may interfere with low level strontium analysis due to ingrowth of short-lived bismuth-210 during chemical separations, where lead is retained by the Sr Resin, but is not eluted. If lead-210 is known to be present in samples, minimizing the time between the

final rinse and the elution of strontium to less than 15 minutes will minimize the levels of interfering bismuth-210.

Source: U.S. EPA, National Air and Radiation Environmental Laboratory (NAREL). April 2014. Rev 0 “Rapid Radiochemical Method for Total Radiostrontium (Sr-90) In Building Materials for Environmental Remediation Following Radiological Incidents,” EPA 402-R14-001.
<http://www2.epa.gov/radiation/rapid-radiochemical-methods-selected-radionuclides>