**An Efficient Separation Method of 90Sr for Various Environment Samples Using Cation Exchange Resin**

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Colum separation method using cation exchange resin (Chromalite® CGC100X8, 100-200 mesh, H+ form, CEX) is a safer, faster and more convenient alternative to the traditional fuming nitric acid method for radiochemical analysis of 90Sr in environmental samples. This method has been applied for several years to analyze 90Sr in seawater as part of marine environmental monitoring efforts around the Korean Peninsula.

This study aims to expand the application of the CEX separation method to other types of environmental samples such as soil, sea sediment, and pretreated ash sample from biological materials including fish, seaweed, shellfish, and milk. Acid extracts from soil and sea sediment are diluted to 0.2M HCl using NaOH and deionized water, then loaded onto CEX (8 x 26 cm) without additional chemical pretreatment. Strontium (Sr) is selectively recovered using 4M HCl solution following a calcium (Ca) removing step. The 4M HCl eluate is either diluted for a 2nd CEX (8 x 22 cm) separation or processed through carbonate precipitate to recover Sr. For sea sediment samples with extremely high Ca content (~30%), a large CEX (8 x 33 cm) is required to minimize Sr loss during the loading step due to Ca interference. Unlike inorganic samples, ash samples are completely digested using a fusion digestion system. The dissolved ash is converted into a weakly acid solution and loaded onto a CEX (5 x 26 cm). Most bio-ash samples achieve sufficiently purification and high chemical recovery over 80% in a single column separation. However, samples with high Ca content, such as milk and fish, require a 2nd column separation using smaller CES (3 x 26 cm).

Chemical recoveries of Sr in soil and sea sediment were over 80% and 60%, respectively, in sequential column separation with or without the carbonate precipitation step. Most bio-ash samples yielded over 80% recovery. The chemically purified 90Sr was stored for 2 weeks to allow secular equilibrium, after which 90Y was quantified via Cerenkov radiation counting using a low-background LSC.

This method is cost-effective due to the reusability of CEX, which regeneration through a simple process. It is also efficient, minimizing the need for extensive chemical separation and allowing simultaneous separation of multiple samples. Furthermore, the column work is automized via a programmed solution injection system.

This separation method was successfully applied to both terrestrial and marine environmental samples in 2024.