

ISOTOPIC SIGNATURE OF SELECTED RARE EARTH ELEMENTS FOR NUCLEAR ACTIVITIES PROFILING USING CLOUD POINT EXTRACTION AND ICP-QQQ-MS

Dominic Larivière, Radioecology Laboratory, Chemistry Department, Laval University, Québec City, Canada

dominic.lariviere@chm.ulaval.ca

Charles Labrecque and Pablo Jorge Lebed, Radioecology Laboratory, Chemistry Department, Laval University, Québec City, Canada

We developed a procedure for the determination of isotopic ratios of three rare earth elements (Nd, Sm, Eu). These light REE are of interest in nuclear science since they could be produced during nuclear fission, and thus can impact the natural isotopic abundance. A new cloud point extraction (CPE) method was used as a pre-concentration/separation strategy prior to measurement by inductively coupled plasma tandem mass spectrometry (ICP-QQQ-MS). To minimise polyatomic interferences in MS, the combination of decontamination achieved by CPE and the use of the reaction/collision cell in He and NH₃ mode was attempted and provided optimal results for the analysis of isotopic ratio in environmental samples.

Isotopic ratios were initially measured in samples from San Joaquin soil (NIST-2709a), an area with little contamination of nuclear origin. Finally, samples collected from three sites with known nuclear activities (Fangataufa Lagoon in French Polynesia, Chernobyl and the Ottawa River near Chalk River Laboratory) and they all exhibited altered isotopic ratios for ^{145/143}Nd, ^{147/149}Sm, and ^{151/153}Eu.

These results demonstrate the potential of the combined use of CPE and ICP-QQQ-MS for the detection of altered isotopic ratio in environmental samples applicable to nuclear anthropogenic contamination.