**High-Sensitivity Determination 238Pu, 239Pu, 240Pu and 241Pu using ICP-MS/MS**

**Ji-young Park1\*, Dayoung Lee1, and Jong-Myoung Lim1**

*1Korea Atomic Energy Research Institute (KAERI), 111 Daedeok-daero 989 beon-gil, Yuseong,gu, Daejeon, 34057, South Korea*

*\*Corresponding Author: Ji-young Park (pjyoung@kaeri.re.kr)*

This study aims to optimize measurement conditions of triple quadrupole inductively coupled plasma mass spectrometry (ICP-MS/MS) to improve the accuracy and sensitivity of trace plutonium (Pu) isotope analysis in environmental samples. ICP-MS/MS enhances Pu analysis specificity by selectively filtering masses in the reaction cell to effectively suppress isobaric interference from 238U.

We thoroughly characterized key parameters for Pu isotope (238Pu, 239Pu, 240Pu, 241Pu) measurement - including ion kinetic energy control, ion lens settings, and reaction gas flow rate—and systematically optimized them. Uranium and plutonium standard solutions were used to establish optimal Pu detection conditions, and measurement accuracy was evaluated by comparison with MC-ICP-MS results. Certified reference materials (CRMs) of soil matrices were analyzed under these optimized conditions to confirm improvements in accuracy, precision, and detection limits for Pu isotopes.

The findings of this research are expected to contribute to environmental radioactivity monitoring and nuclear non-proliferation research by providing a highly reliable method for Pu isotope analysis.