Contribution ID: **463** Type: **Verbal**

Determination of 129I in aerosols using pyrolysis and AgI-AgCl coprecipitation separation and AMS measurement

Tuesday, 15 May 2018 16:00 (15 minutes)

Airborne radioactive iodine is a key concern for transport and dispersion of radioactive contamination and radiation exposure evaluation during nuclear accidents and nuclear emergency preparedness. Long-lived 129I in aerosols is vital for reconstruction of level and distribution of short-lived and highly toxic 131I, as well as understanding the knowledge of atmospheric circulation process of iodine. However, aerosol 129I concentration is hard to measure due to its low concentration in the areas remote from nuclear pollution sources. In this study, a novel method for 129I in aerosols collected on glass fiber filter was developed using separation of high-temperature pyrolysis and AgI-AgCl coprecipitation coupled to highly sensitive AMS measurement. The chemical yield is 85±5% for iodine. The detection limit for 129I in aerosol is 1.8e6 atoms, which is 4 times lower than that using ashing-solvent extraction method in previous study. For aerosol samples collected in Asia with 129I/127I ratio of (1-10) e-9, only 500 m3 of air is sufficient for determination of 129I. Using this newly developed methods, the aerosol samples collected in an inland Chinese city were measured for 129I concentrations ranging within (0.31-7.3) e5 atoms/m3, and 129I/127I ratios of (0.26-7.4) e-8, which is is comparable to those in aerosols collected in Japan and Brazil, while 1-2 orders of magnitude lower than those in Europe.

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Session Classification: NAM 2

Track Classification: Nuclear Analytical Methods