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Peculiarities of plutonium isotopic ratio determination by elemental mass spectrometry

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Inductively coupled plasma high resolution mass spectrometry (ICP-MS) is widely used technique for 240Pu/239Pu isotopic analysis tool which leads to use plutonium isotopic composition to assess the artificial radionuclide source in the environment fast and accurately. ICP-MS measurements usually are performed in low resolution mode (m/dm=300) to enhance and maximize plutonium signal sensivity. In this measurement mode various interferences emerge from sample solutions and are likely to overlap plutonium isotopic signal. To study occurring interferences soil samples were used. They were prepared by using ion exchange and extraction chromatography separation techniques. It was determined that 238U1H+ interfering ion must be taken into the account if 238U+ signal in the sample exceeds 1E5 cps. However, to take into the account 238U1H+1H+ interference is not necessary. Besides, it is strongly not recommended to use hydrochloric acid as a final stabilizing matrix as serious 204Pb35Cl+ interferences occur on 239 a.m.u mass. For final stabilizing matrix five solutions were tested and it was found that the best one to use is ultrapure nitric acid as it creates the lowest background signal on 239 and 240 a.m.u masses.

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