

A new milestone for ultra-low $^{236}\text{U}/^{238}\text{U}$ isotope ratio measurements by ICP-MS/MS

Hugo Jaegler^{*1}, Alkiviadis Gourgiotis²

¹Institut de Radioprotection et de Sûreté Nucléaire (IRSN), PSE-ENV/SAME/LERCA, F-78110, Le Vésinet, France

²Institut de Radioprotection et de Sûreté Nucléaire (IRSN), PSE-ENV/SPDR/LT₂S, F-92260, Fontenay-Aux-Roses, France

Associated content

Correction of hydride formation on the $^{236}\text{U}/^{238}\text{U}$ isotope ratio (Equation 1)

$$\begin{aligned} \left(\frac{^{236}\text{U}^+}{^{234}\text{U}^+}\right)_{\text{corr}} &= \frac{(^{236}\text{U}^+)_{\text{meas}} - \frac{(^{238}\text{UH}^+)_{\text{meas}}}{^{238}\text{U}^+} \times ^{235}\text{U}^+}{^{234}\text{U}^+} \\ \left(\frac{^{236}\text{U}^+}{^{234}\text{U}^+}\right)_{\text{corr}} &= \left(\frac{^{236}\text{U}^+}{^{234}\text{U}^+}\right)_{\text{meas}} - \left(\frac{^{238}\text{UH}^+}{^{234}\text{U}^+}\right)_{\text{meas}} \times \frac{^{235}\text{U}^+}{^{238}\text{U}^+} \\ \left(\frac{^{236}\text{U}^+}{^{234}\text{U}^+}\right)_{\text{corr}} &= \left(\frac{^{236}\text{U}^+}{^{234}\text{U}^+}\right)_{\text{meas}} - \left(\frac{^{238}\text{UH}^+}{^{234}\text{U}^+}\right)_{\text{meas}} \times \frac{1}{137.88} \end{aligned}$$

Influence of the $^{235}\text{UH}^+$ interference on the measurement of $^{236}\text{U}/^{238}\text{U}$ isotope ratio (Equation 5):

$$\begin{aligned} \frac{\text{UH}^+}{\text{U}^+} &= \frac{^{235}\text{UH}^+}{^{235}\text{U}^+} \times \frac{^{238}\text{U}^+}{^{238}\text{U}^+} \times \frac{^{236}\text{U}^+}{^{236}\text{U}^+} \\ \Rightarrow \frac{\text{UH}^+}{\text{U}^+} &= \frac{^{235}\text{UH}^+}{^{236}\text{U}^+} \times \frac{^{238}\text{U}^+}{^{235}\text{U}^+} \times \frac{^{236}\text{U}^+}{^{238}\text{U}^+} \\ \Rightarrow \frac{^{236}\text{U}^+}{^{238}\text{U}^+} &= \frac{\text{UH}^+/\text{U}^+}{^{235}\text{UH}^+/\text{U}^+} \times \frac{^{235}\text{U}^+}{^{238}\text{U}^+} \\ \Rightarrow \frac{^{236}\text{U}^+}{^{238}\text{U}^+} &= \frac{\text{UH}^+/\text{U}^+}{^{235}\text{UH}^+/\text{U}^+} \times \frac{1}{137.88} \end{aligned}$$