



## **<sup>99</sup>Tc measurement with matrix-assisted low energy AMS**

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### **<sup>99</sup>Tc measurement with matrix-assisted low energy AMS**

A renewed study of Tc and Ru fluoride anion formation in a Cs sputter source has confirmed an earlier observation that the relative yields of  $\text{RuF}_n^-$  are very dependent on the sputter target matrix composition. The yield of  $\text{RuF}_5^-$  can be suppressed relative to  $\text{TcF}_5^-$  with the presence in a  $\text{PbF}_2$ -based sputter target of certain elements, some strongly as in the case of Nb and some modestly as in the case of Fe. This provides an opportunity for  $^{99}\text{Tc}$  to be detected by low energy AMS using  $^{99}\text{TcF}_5^-$  with the assistance of a carefully composed matrix to form the sputter target. Depending on the Ru content in a sample and the effort to reduce it during sample preparation, best detection limits of  $\leq 5$  fg  $^{99}\text{Tc}$  per mg  $\text{FeO}_x\text{H}_y$  precipitate were indicated so far, using targets made of  $(^{99}\text{Tc})\text{FeO}_x\text{H}_y+\text{PbF}_2$  ( $\sim 1:10$  by weight). In preliminary linearity tests with the detection of +4 ions in the final ionization chamber, the determination of  $^{99}\text{Tc}$  concentration within a  $\text{FeO}_x\text{H}_y$  precipitate was shown possible with  $\sim 15\%$  uncertainty. The quantification was made simply by the average count rate of  $^{99}\text{Tc}$  subtracting that of  $^{99}\text{Ru}$  (measured as 0.748 times that of the isobar-free  $^{101}\text{Ru}$ ), over an hour long time under steady sputtering conditions. This quantification method avoids the normalization difficulties due to the lack of a stable Tc isotope; it is similar to ICP-MS except that with AMS it is a 'solid-state solution' that is placed into a Cs sputter ion source. This method has the potential for analyzing  $^{99}\text{Tc}$  in Arctic seawater samples using  $\leq 2$  L volume sizes.

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