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Title: Alternative Sample Loading Preparation for Thermal Ionization Mass Spectrometry

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Abstract:

This contribution describes a new sample loading method for Thermal Ionization Mass Spectrometry (TIMS), which is used in nuclear safeguards and non-proliferation efforts worldwide and is known as the “gold standard” in isotopic ratio measurements of plutonium. TIMS analysis is used to determine grades of nuclear material and the extent of enrichment at production sites. The current sample loading method for TIMS analysis is known as “bead-loading”. While it provides the lowest detection limit of any known method for plutonium analysis, bead-loading is a difficult, time consuming, and expensive method that results in up to 20% sample loss. The major encumbrance of the method is the need to manually place a small polymer bead (~40 μm diameter) containing the plutonium sample onto a narrow and fragile ionization filament. We have developed an alternative sample loading method that eliminates the difficult and time-consuming steps by pre-coating the ionization filaments with a thin polymer film. Sample loading times have been reduced from hours to minutes. The films remain stably anchored to the filament, thus preventing sample loss. Ongoing TIMS measurements are testing our hypothesis that the method will increase overall measurement efficiency/sensitivity by isolating the sample in close proximity to the filament.