

**Mo-99 2016 TOPICAL MEETING ON
MOLYBDENUM-99 TECHNOLOGICAL DEVELOPMENT**

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**Measurement of Trace Alpha-Emitting Actinide Contaminants in
Molybdenum-99**

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ABSTRACT

Commercial producers of molybdenum-99 are being encouraged to replace high-enriched uranium with low-enriched uranium in their production processes. The low-enriched uranium has more uranium-238 than high-enriched uranium, and will make more plutonium-239 than the previous processes. The molybdenum-99 produced by new low-enriched processes must be shown by analysis to be free of plutonium. We report a fast, accurate method for measuring the alpha-emitting actinide elements in high-activity molybdenum-99. The sample of molybdenum-99 is acidified and 50 µg of a rare earth carrier is added. Then the mixture is made basic with ammonium hydroxide. The rare earth carrier precipitates as a hydroxide, carrying all of the actinide elements with it. The precipitated rare earth carrier is separated from the high-activity molybdenum-99 by filtration. The alpha emitting actinide elements are then measured in the rare earth carrier by alpha spectrometry. The chemical procedure takes an hour or two, and the alpha spectrometry requires twelve hours of counting. Alpha-emitting actinide elements can be measured at 1 part alpha activity in 1.0E10 parts molybdenum-99.