

Development of a New Beryllium Oxide Standard Reference Material

Beryllium and compounds containing beryllium are used in the production of high-performance alloys that are relied upon in the aerospace and defense industries. These chemicals pose a significant health risk for workers in these fields because exposure to Be can cause beryllium disease, a serious, chronic, and sometimes fatal illness in susceptible individuals. Beryllium workers must be carefully monitored for potential exposure. These monitoring systems require properly validated analytical methods for the determination of Be-containing particles collected on swipes and monitoring filters. Validation of these methods is hampered by the absence of suitable reference materials. This is especially the case for BeO and other Be compounds that are extremely difficult to dissolve. The U.S. Department of Energy (DOE), the National Institute for Occupational Safety and Health (NIOSH), and NIST have entered into an agreement to develop a new BeO SRM.

G.C. Turk, M.R. Winchester, and T.A. Butler (Div. 839)

Given the significant health concerns associated with BeO, a somewhat unconventional approach to the production and certification of an SRM has been initiated. Specifically, the sample preparation leading up to the ICP-OES analyses are being performed by four DOE and NIOSH laboratories with extensive experience working with Be materials. NIST has developed the complete experimental design and is requiring these laboratories to comply with it. An Excel spreadsheet was developed at NIST and provided to the labs to guide them through the sample preparation process and to ensure that all necessary sample preparation data are recorded. In addition to the spreadsheet, NIST has provided each of the labs with a sample preparation kit. This kit contains all chemicals needed to perform preparations, including the bottled BeO candidate SRM, the high-purity, well-characterized Be metal, an internal standard stock solution, and acid. It also contains all bottles, labels, and packaging needed to ship the digested solutions back to NIST for analysis. Finally, the kit contains small pieces of gold wire having mass values that are traceable to mass standards maintained by NIST. These wires are being used by the labs to establish traceability of their mass measurements.

Measurement of Be in the BeO SRM will be performed using high-performance inductively-coupled plasma optical emission spectrometry (ICP-OES). The ICP-OES instrument will be calibrated with solutions prepared from high-purity, well-characterized Be metal. The SRM will be released in 2007 and will be used to validate analytical

methods used for Be determinations. It may also be used to set up a proficiency testing program to implement the requirements of CFR850 (Chronic Beryllium Disease Prevention Program), as specified in 10 CFR Part 850.24, Section (f) (Periodic Exposure Monitoring Analysis), preventing exposure to Be that leads to chronic beryllium disease.

A worker is preparing to sample BeO. The new BeO SRM will enable the validation of analytical methods for the determination of Be.



Photo courtesy of Dr. Gregory Day, NIOSH