ARIZONA TEST DUST: Purpose and Procedures

Motivation
The Need for an Aerosol SRM:
• To calibrate instruments
• For validation of results
• To address digestion efficiency
• For enrichment factor calculations

Does it Meet the Requirements?
✓ Mimics naturally occurring aerosols
✓ Must be relatively inexpensive
✓ Must be readily available
✓ Must be suitable for analysis of crustal, marine, and anthropogenic-type elements
? Must be homogenous

What is Arizona Test Dust?
Arizona Test Dust (ATD) is manufactured by Powder Technology Inc. It is collected in large quantities on canvas cloth in the Salt River Valley, Arizona and is only dry roasted and sifted to obtain particles in the range of 53-71 µm.

What is the Purpose?
Arizona Test Dust has been used as a test contaminant for air filtration, automotive, and heavy equipment components for decades. It’s also referred to as Arizona Silica and fits requirements as a Consensus Reference Material for marine aerosols.

METHODS FOR DIGESTING ATD

Berger Leach Procedure
• Put ATD samples in the hot bath at 90 °C with solution of 25% HAc + 0.2 M HH for 10 minutes (Berger solution is passed over toyopearl column and stored in refrigerator prior to use)
• Centrifuged after 2 hours and decanted bio-material into syringe before filtering
• Dried-down samples overnight
• Redissolved with 0.32 HNO₃ and spiked with indium
• The samples are then analyzed using ICP-MS

Total Digestion Procedure
• Samples are added to Teflon microwave vials followed by H₂O₂ (0.2 mL), q-HNO₃ (4.0 mL), and Optima HF (0.8 mL)
• Vials are capped tightly and placed in the MARS 6 microwave. The temperature ramps up to 150°C over 20 minutes and holds for 30 minutes
• The samples are then uncapped and dried down overnight before being redissolved in 0.32 M HNO₃ (3.0 mL), transferred to autosampler vials and spiked with indium
• The samples are then ready to be analyzed using the ICP-MS

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Average Concentrations of Key Elements
Averages and standard deviations of each element normalized to average to show variability of each element in the ATD.

Within Lab Groups
Each lab group’s ability to make precise repeated measurements of ATD was calculated for each individual element. Good precision does not always guarantee good accuracy!

Figure 1: Box and Whisker plot showing the average determined concentrations and standard deviations of the results for a number of important elements

Figure 2 & 3: Analytical reproducibility of ATD for elemental concentrations (e.g., Aluminum and Iron) for each lab group. Error bars represent one standard deviation.