Chemical Analysis of Beryllium Wall Deposits What are our Options

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Beryllium Health & Safety Committee

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Purpose

The purpose of this presentation is to evaluate and present the options available to Industrial Hygienists and Chemists if wall deposits are to be considered part of the sample.

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Presentation Outline

- Wall Deposits summary
- Current Drivers
- Current actions by OSHA, NIOSH, AIHA, ASTM, DOE and DOD
  - Revisions to analytical methods
- Possible Options
- Future Options
- Conclusions/Path Forward

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Wall Deposits Summary

- This is not a new issue
- This is not a beryllium-specific issue
- This is not a DOE-specific issue
- This is pressing on us more every day

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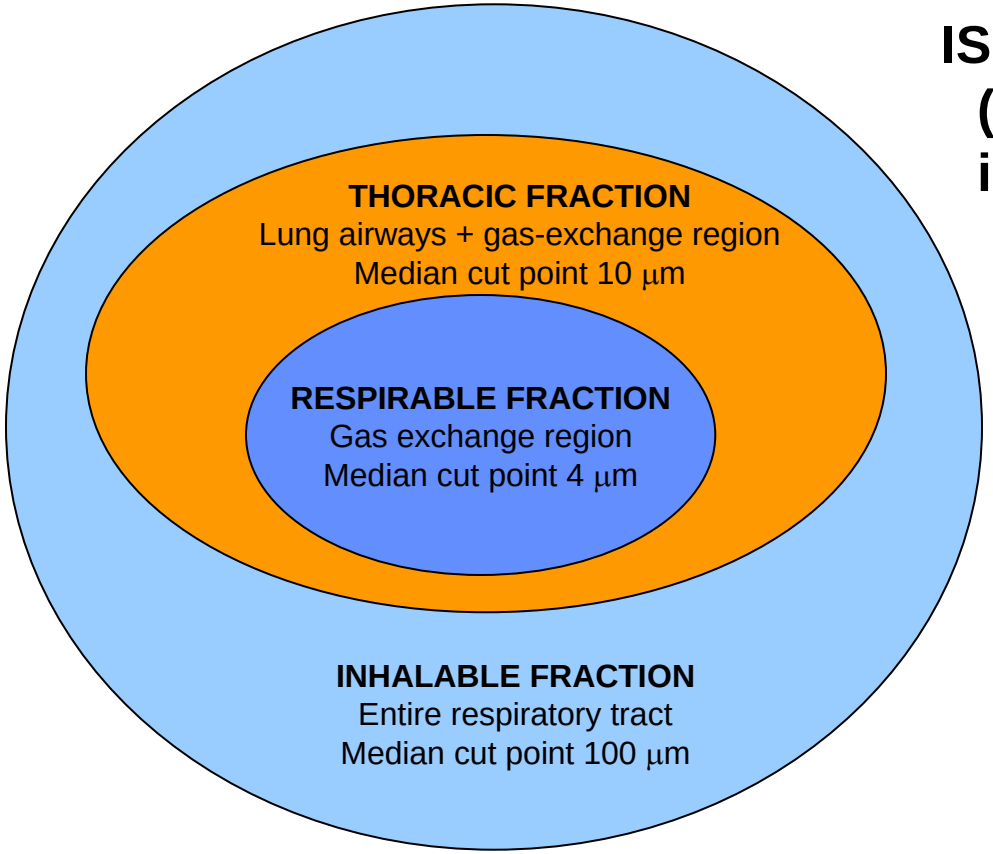
Current Drivers



ISO Conventions – ISO 7708 (1995) International push to inhalable fraction:

- **Particles between 10-100 μm not efficiently sampled by CFC**
- **When CFC wall deposits included, more closely matches IOM (inhalable) performance**
- **ACGIH NIC for beryllium proposes inhalable fraction**

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Current Actions - OSHA

- Analytical method for Cr(VI), ID-215 Version 2
  - Requires cassette walls to be wiped down
  - Method has been validated
- Analytical method for metals, ID-121 and ID-125G
  - Requires rinsing and wiping down cassette walls
  - Method with wiping down walls NOT validated
- Analytical method for Arsenic, ID-105
  - Recommends wiping “if necessary”
- Method for metals from solder operations, ID-206
  - No recomendations

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Current Actions NIOSH

- **Discussed in the “blue pages” Chapter O, Part 7, in the preamble to the manual. But there is no other reference in either:**
  - **NIOSH manual of Analytical Methods (NMAM)**
  - **Particles Not Otherwise Regulated (PNOR) Method (0500)**
  - **Any other substance specific method using the CFC.**

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Current Actions – AIHA

- **Study by Sampling and Laboratory Analysis Committee, 2007**
  - **Did not take a position either for or against including wall deposits in the sample**
  - **Did suggest that this is an issue to consider.**

- **Laboratory QA Policy**
  - **If standard methods not used "as is":**
    - **Lab must state up front it is using a modified method**
    - **Performance data required**

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Current Actions – ASTM International

- Subcommittee D22.04 on Workplace Air Quality
- New analytical methods advise users to determine whether the sample needs to include wall deposits
  - Details provided in non-mandatory appendices
  - Guidance provided on ways to include wall deposits
- It is expected that this recommendation will be added to older standards as they are reviewed (once every five years)

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What DOE and DOD Sites Are Doing

- LLNL is including wall deposits
- Most DOE site have not followed suit.
- Recommendation to Army to include wall deposits in the analysis of air sampling for aerosols..
- Recommendation to the Navy Environmental Health Center to include wall deposits in similar analysis.

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Issue?

- **There is not consistent guidance.**
- **Sampling Characteristics of various samplers against the inhalable convention:**
  - traditional closed-face, 37 mm polystyrene/acrylonitrile cassette (CFC)
  - Institute of Occupational Medicine (IOM) sampler
  - Button sampler developed by the University of Cincinnati,
  - RespiCon sampler

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Options Available

- Wipe interior walls of cassette and include with sample
  - What OSHA does now
- Rinse interior walls
  - OSHA believes this is less effective than wiping and does suggest a combination of the two
- In situ digestion – French, ISO-15202-2

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Pharmaceutical Industry

- Abbott Laboratories in Chicago, IL
- Developed in 1992
- Disposable, inexpensive filter cartridge device.
- Filter and cylindrical cap insert sealed together to form an enclosure that fits snugly inside a 37 mm CFC.

- This works well for gravimetric analysis by there is no guidance for metals digestion and safety issues with digestion with acids.

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New materials

- 37 mm conductive polypropylene cassettes on the market in addition to the clear styrene plastic cassettes.
- No data on how well they work to eliminate the problem of wall deposits.

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Potential future options

- Redesign of cassettes to allow for easier access to the walls for wiping
- Material substitution to eliminate causative issues such as static charge or turbulence.
- Development of a fully digestible sample capsule that could be used for both gravimetric and chemical analysis of the sample.
- The development of better samplers. Inexpensive, disposable, “off the shelf” samplers for each of the ACGIH particle size fractions.
- Redesign cassettes to allow easy digestion/extraction inside the cassette.

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Conclusions/Path Forward

- **Steering committee to look into this Issue.**
  - **Identify alternatives**
  - **Propose research**
  - **Identify funding opportunities**

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