Retention and Collection Efficiencies of a Batch-Type Wetted Wall Bioaerosol Sampling Cyclone

Presented by:

Maria King  
Ben Thien  
Andrew McFarland

Texas A&M University System  
College Station, TX

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Aerosol Technology Laboratory
Schematic of batch-type cyclone

Diagram showing the components of a batch-type cyclone, including the blower, filter, exhaust, and inlet.
Road Map

• Characterization of the Collection and Retention Efficiencies of the Batch-Type Wetted Wall Bioaerosol Sampling Cyclone:
  – Retention testing
    • 1 µm PSL
    • *Bacillus globigii* (BG) spores (Genexpert)
  – Aerosol testing
    • 1 and 3 µm PSL and 3 and 10 µm oleic acid
    • *Bacillus globigii* (BG) spores (TSA plating)
Batch-Type Wetted Wall Bioaerosol Sampling
Cyclone Test Setup

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Batch-Type Wetted Wall Bioaerosol Sampling Cyclone Retention Tests with 1 µm red PSL Particles

![Graph showing the retention of particles over time.](image-url)
Areas of cyclone wall where retention of food coloring occurs

Percent of 1 µm PSL particles recovered during successive 1 min wash cycles
Cepheid self contained cartridges for the RT-PCR assay of BG by the Genexpert
Genexpert RT-PCR calibration curve

\[ y = -3.3093x + 50.944 \]
Batch-Type Wetted Wall Bioaerosol Sampling
Cyclone Retention Results with BG using RT-PCR Analysis
Data from tests with 1µm PSL are shown for comparison
Batch-Type Wetted Wall Bioaerosol Sampling
Cyclone aerosol efficiency with PSL and Oleic Acid Test Particles
Batch-Type Wetted Wall Bioaerosol Sampling Cyclone Aerosol Efficiency with and without the Exhaust Filter
Batch-Type Wetted Wall Bioaerosol Sampling
Cyclone Aerosol Efficiency

BG results are based on plating counts
Conclusions

• The Batch-Type Wetted Wall Bioaerosol Sampling Cyclone retention efficiency was tested with 1 µm PSL particles. After 8 hours the retention is about 10%.
• A Genexpert PCR machine was calibrated and used to evaluate the retention of BG spores in the Batch-Type Wetted Wall Bioaerosol Sampling Cyclone. Variable results were obtained due to the semi quantitative nature of the Genexpert.
• An aerosol test setup was built to test the aerosol collection efficiency of the Batch-Type Wetted Wall Bioaerosol Sampling Cyclone.
  • The collection efficiency of the cyclone was found to be 51% with 1 µm PSL, 55% with 3 µm PSL, 33% with 3 µm oleic acid, and 1.5% with 10 µm oleic acid.
  • When the exhaust filter was removed, good agreement was found with previous results with 3 µm oleic acid particles, and a slight increase with 1 and 3 µm PSL particles was observed.
  • The Batch-Type Wetted Wall Bioaerosol Sampling Cyclone collection efficiency was tested with single spore BG, and found to be 32%.