

is, real-time instruments used in evaluating properties of nanoparticle aerosol clouds; and compare the resulting concentrations and size distributions to these obtained by electron microscopy (EM).

**Methods:** Sodium chloride nanoaerosols were generated using a Collison Nebulizer. The aerosol cloud was passed through a radioactive neutralizer and a diffusion dryer prior to entry into the test chamber. The chamber was evaluated for air leakage, relative humidity, air flow patterns, and dispersion patterns. Real-time measurements were obtained with the OPC, CPC, and SMPS. Air samples were also collected on membrane filters for EM analysis.

**Results:** The CPC was stable and consistent but the results were limited to nanoparticle concentration. The SMPS was effective in measuring the concentration and size distribution of the nanoparticle cloud. Comparable concentrations of nanoparticles within the size range of 20nm to 200nm, with a median diameter range of 80nm to 100nm were observed as determined by the SMPS and EM. The SMPS and EM sample results were comparable. The OPC provided particle concentrations in selected nanoparticle size ranges but did not perform well at elevated nanoparticle aerosol concentrations.

**Conclusions:** Based on the information obtained from our research, the direct reading instruments examined in this study should be used with caution for characterization of size and concentrations of a nanoparticle cloud. Electron microscopy should be used to verify size and concentration reported by the instruments.

#### SR-401-20

#### Nanoparticle Leakage through Staple Punctures in N95 Single Use Filtering Facepiece Respirators

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**Objective:** NIOSH-approved N95 filtering facepiece respirators (FFPR) are widely used in industry where personnel are exposed to aerosolized particles that can produce adverse health effects. The manufacturing processes for some N95 FFPR attach the

head straps by stapling them directly onto to the respirator filter. This method punctures the filter media and creates an open space between the staple and the filter where leakage of particles can occur. This study evaluates the effect of stapled head straps on respirator efficiency using 5 different N95 FFPR models challenged with 30 to 500 nm polystyrene latex spheres when the stapled head straps are left intact, stretched, and the staple punctures sealed.

**Methods:** A polystyrene latex aerosol is generated by a 3-jet Collison nebulizer operating at 20 psi. The aerosol cloud is dried and charge neutralized using a silica gel desiccant and a radioactive beta source (Kr85). The aerosol is introduced and mixed in the top part of the testing chamber above the respirator test assembly. A Scanning Mobility Particle Sizer is used to measure particle concentration inside and outside the respirator test assembly and this ratio is used to determine respirator efficiency.

**Results:** N95 FFPR efficiencies differed by model, particle size, and staple condition. There is significant difference between different models of FFPR and among the efficiencies of a single model when the head straps are left intact, stretched, and when the staple puncture is sealed. The lowest efficiencies were observed when head straps were stretched and at the 50–60 nm particle sizes. For some FFPRs, efficiencies were below 95%.

**Conclusions:** The study suggests that nanoparticle concentrations inside N95 FFPRs with stapled head straps (attached to the filter media) are expected to be higher than models with head straps attached using a method that does not puncture the filter.

#### CS-401-18

#### Emerging Issues Associated With the Use of Nanomaterials In Formulation and Use of Consumer Products: An Information Sharing Opportunity for the Nanotechnology Working Group

S. Maberti, ExxonMobil, Houston, TX. Participation in the AIHA® Nanotechnology Working Group (NTWG) can provide opportunities for sharing information about

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## ABSTRACTS

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