ABSTRACT

Title: Study on Sampling and Analytical Method for Nanoparticles
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Abstract:

Nanosilica and nanozeolite synthesized from rice husk (RH) were investigated for their potential to develop a low cost nanofilter membrane as an alternative to replace nylon membrane used in the Nanoparticle Respiratory Deposition (NRD) sampler for capturing titanium dioxide (TiO_2) nanoparticles suspended in air. Due to its exceptional adsorption capacity to many inorganic materials, graphene oxide was also investigated for its potential to capture the TiO_2 nanoparticles. Nanofilters were developed using various concentration of synthesized nanomaterials by depositing it on a polyvinylidene fluoride (PVDF) membrane using the layer deposition method and were further characterized by Field Emission Scanning Microscopy/Energy Dispersive X-ray (FESEM-EDX) analysis. To investigate its potential in capturing nanoparticles, each nanofilters developed were exposed to TiO_2 nanoparticles for 15 minutes with an average air flow of 2.5 L/min and were compared with the conventional nylon membrane used in NRD. Although certain amount of Ti element was detected using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) analysis for nylon membrane that exposed to TiO_2 nanoparticles, however, the ICP-MS analysis also discovered significantly high background levels of Ti (1212 µg/g) in the unexposed nylon membrane, thus strictly unsuitable for TiO2 nanoparticles sampling and invalid for Ti element analysis. Among all nano filters developed, nanozeolite filter (0.1 % w/v) showed the highest concentration of Ti captured (81.7 µg/g) compared to nanosilica (56.7 µg/g) and graphene oxide (8.2µg/g) filters. Interestingly, all developed nanofilters did not show any presence of Ti in its background levels further suggests its purity in capturing Ti nanoparticles in the air.

Keyword: Exposure Assessment, Nanofilter, Nanoparticle, Nylon, Personal Sampler, Titanium Dioxide