S3.1.4 ADSORPTION PERFORMANCE OF ISOPROPANOL CONTAMINATION FOR THE CHEMICAL FILTERS USED IN A CLEANROOM

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In the cleanrooms of the semiconductor factories removed airborne molecular contamination (AMC) are utilized expansively by Chemical filters. Adsorption by activated carbons (AC) as filter media within the chemical filter is one of the useful methods for removal of organic airborne contamination in a cleanroom. The objective of this study is to judge coconut shell activated carbon adsorbent-loaded nonwoven fabric filter performance by deciding adsorption characteristics, breakthrough curves, and pressure drop. The testing conditions were kept at 25 ±1°C, and relative humidity at 44 ± 1% with face velocities of 0.3, 0.5 and 0.7m/s for capacity decision. The challenge gas concentrations of isopropanol (IPA) were adjusted at 10, 35, and 50 ppm to promote the breakthrough of filter adsorption. The concentrations were monitored by a real-time photo-ionization detector. Results presented that breakthrough curves related to the challenge vapor concentration and the face velocity. Adsorption capacity was increased with increased challenge gas concentration and raised face velocity significantly. Results were analyzed by the Freundlich and Langmuir equation at different face velocity and determined the characteristic parameters for each adsorption isotherm. The results show that the Langmuir model is better fit compared to Freundlich model. In order to examine the adsorption mechanisms, three simplified kinetic models, i.e., the pseudo-first-order, second-order kinetic models and intraparticle diffusion model were utilized to present the kinetic data and the rate constants were computed. The rate parameter for the pseudo-first-order mechanism, k1, rate parameter for the pseudo-second-order mechanism, k2, and rate parameter, ki, of intraparticle diffusion were compared. It was detected that the pseudo-second-order adsorption mechanism is superior and the overall rate of the GAC adsorption process appears to be influenced by more than one step that is both the external mass transfer and intraparticle diffusion mechanisms.