

132c Design and Construction of a Dual Purpose Air Filter for Semiconductor Clean Rooms

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In the semiconductor industry, the need for quality control has become integral for success. Reduction of airborne contaminants provides one means of achieving a high level of quality control. Environmental contaminants resulting from the chip manufacturing process consist of Airborne Particulate Contaminants (APC) and Airborne Molecular Chemical Contaminants (AMCC). The AMCC primarily consists of various acidic and basic vapors in addition to siloxanes, phthalates, amines and dopants. Currently, HEPA filters are used to remove APC; however, these filters leave behind an assay of AMCC. Filtration systems are available that solely remove AMCC, yet no single system can remove both particulate and chemical contaminants. The objectives of this study are to design and construct a single filtration unit that can remove both APC and AMCC. The filter is comprised of a HEPA media combined with a novel filter material, microfibrinous media, developed at Auburn University. Microfibrinous medium is a high contacting medium that is tailored to filter an assay of AMCC. The HEPA media is capable of removing 0.3micron particulate to 99.99% while the microfibrinous layer filters all chemical contaminants present. The final design will be able to filter all AMCC to a concentration of less than 1ppb while producing no more than 2in H₂O pressure drop. The microfibrinous medium is a sinter-locked network of micron diameter fibers (<1-20micron) used to entrap small particulate (10-300micron) manufactured using a high-speed specialized wet-lay process. This novel filter technology is easily tailored to the appropriate manufacture bay by selecting and entrapping a variety of sorbents and catalysts. Initial studies indicate activated carbon as a good sorbant for organic vapors, while zeolites and alumina are utilized for acidic and basic gases. The results of the study include breakthrough plots of contaminant concentrations versus time. Other tests will determine optimized bed depth and catalyst loading in order to minimize costs of materials and pressure drop.