ULTRA HIGH EFFICIENCY WIDE SPECTRUM PLEATED DEPTH FILTER

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ABSTRACT

A cartridge depth filter that utilizes nano alumina electropositive non-woven media was characterized for flow rate, dirt holding capacity as well as filtration efficiency for virus and bacteria. The pore size of the media is 2 microns. Sub-micron particles are primarily retained by electroadhesive forces. A dual layer version of the filter was found to retain >6 LRV of MS2 and >7.5 LRV of E coli at a face velocity of 5 cm/min. Another version of the nano alumina filter containing powdered activated carbon (PAC) and with a pore size of 3 microns had similar particle retention to the nanoalumina filter.

The filter media was tested versus several other electropositive charged depth media and membranes that are commercially available. When challenged with A2 fine test dust at 100 and 250 NTU, the nano alumina as well as the PAC filter was capable of reducing turbidity to less than 0.01 NTU (beta efficiency >25,000) until reaching a specified terminal pressure drop of 30 psi. One of the competitive filters was found to leak substantial amounts of test dust. Despite the fact that the nano alumina filter depends upon ion attraction, its adsorption efficiency for virus and test dust is minimally affected by pH over the range of 4.5 to 9.5 or when in the presence of high salinity (30 g/L). When tested against an electropositive membrane (0.2 micron pore rating) a single layer of the nano alumina had a virus capacity several times greater than the membrane. The more highly efficient two layer nano alumina had a flowrate that was substantially greater than the membranes or those depth media's with pore sizes less than 1 micron.

The dual layer nano alumina filter is very efficient at retaining a wide spectrum of particles, from micron to nanometer size and does so at minimal pressure drop and with significant dirt holding capacity. It is suggested as a drop in replacement for lenticular filters that are widely used in manufacture of pharmaceuticals, cosmetics, medical devices, food and drink and specialty chemicals. Manufacturers of other depth (lenticular) filters offer as many as nine different pore size ratings. The nano alumina avoids the uncertainty in selecting one pore size over another because of its ability to cover a very wide spectrum of applications. Other versions of nano alumina are configured to allow the use of conventional housings providing the user with a choice rather than being committed to a customized housing with its proprietary cartridge. The dual layer nano alumina filters are also proposed for use as point of entry (POE) or point of use (POU) applications.

BIOGRAPHY, Short Sketch

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Bio

Fred is President of Argonide and co-inventor of the nano alumina filter. He founded Argonide in 1994 to invest in nano technology. The filter was invented in 2000 and subsequently received a small business award from NASA lasting until 2004. In 2005, the filter received the Space Foundation Hall of Fame Award. Prior to founding Argonide, Fred was with the Mine Safety Appliance Co, starting as a chemist and retiring as a Sr. Vice President. In the late 1960's and 1970's Fred led the team that developed the first commercialized lithium battery. It evolved into the long life battery that is still the gold standard for pacemakers. At retirement, he managed several divisions including one in gas detection instruments, a chemical plant, an advanced battery development unit and two smaller companies involved in chromatography.