

Removal of Pharmaceuticals from Aquarius Solutions Using Hybrid Ceramic Membranes

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Abstract : The technological advantages of ceramic filtration elements were combined with polyelectrolyte films in the development process of hybrid membrane for the elimination of pharmaceuticals from Aquarius solutions. Previously extruded alumina ceramic membranes were coated with nanosized polyelectrolyte films using Layer-by-Layer technology. The polyelectrolyte chains form a network with nano-pores on the ceramic surface and promote the retention of small molecules like pharmaceuticals and microplastics, which cannot be eliminated using standard ultrafiltration methods. Additionally, the polyelectrolyte coat contributes with its adjustable (based on application) Zeta Potential for repulsion of contaminant molecules with opposite charges. Properties like permeability, bubble point, pore size distribution and Zeta Potential of ceramic and hybrid membranes were characterized using various laboratory and pilot tests and compared with each other. The most significant role for the membrane characterization played the filtration behavior investigation, during which retention against widely used pharmaceuticals like Diclofenac, Ibuprofen and Sulfamethoxazol was subjected to series of filtration tests. The presented study offers a new perspective on nanosized molecules removal from aqueous solutions and shows the importance of combined techniques application for the elimination of pharmaceutical contaminants from drinking water.

Keywords : water treatment, hybrid membranes, layer-by-layer coating, filtration, polyelectrolytes

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