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Ultrafiltration membranes from novel low-fouling copolymers for RO pretreatment applications (Part II)

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ABSTRACT

New approaches to improve the anti-fouling characteristics of existing UF membranes based on polyethersulfone (PESU) have been investigated and reported in our previous paper. By incorporating either very hydrophilic polymers or anti-adhesive copolymers in the dope formulation, novel Multibore® fibers were spun by means of the well-known non-solvent induced phase separation (NIPS) process. These membranes were validated in multiple lab scale pilot trials for various applications, namely surface and waste water purification as well as seawater desalination pre-treatment. This current work focuses on an additive approach based on a novel amphiphilic copolymer of polysulfone, polyethylenoxide and polysiloxane, leading to a membrane surface with alternating hydrophilic and hydrophobic groups. Full scale modules with 60–70 m^2 of surface area have been operated at a variety of sites for a total of over 2 years. For each application, a significantly reduced fouling propensity was achieved compared to the reference modules, leading to a number of benefits. These include the possibility of running the plant at higher fluxes, reducing the energy requirements of the membrane plant, reducing the number of chemical cleans, or improving the overall recovery of the membrane plant. Other advantages which were observed are the ease of cleaning, especially after specific fouling incidents had occurred, either through the intake of unwanted substances in the feed, or after upsets in the regular cleaning sequences. This study shows that it is possible to improve membrane surfaces so that cleaning processes become much more effective, without sacrificing on chemical stability or rejection performance.

Keywords: Copolymer; Fouling; Membrane modification; Ultrafiltration; Seawater

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