



Effect of plasma treatment on the surface properties and antifouling performance of homogeneous anion exchange membrane

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ABSTRACT

A homogeneous anion exchange membrane (AEM) with quaternary ammonium group was treated by low temperature plasma using different feed gases to improve the antifouling performance of AEMs in electro dialysis (ED). X-ray photoelectron spectroscopy analysis indicated that nitrogen- and oxygen-containing functionalities were incorporated, respectively, on the membrane surface after N₂ and O₂ plasma treatments. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) analyses indicated that the surface morphology and surface roughness of the plasma-treated AEMs exhibited various changes because of the different etching effects of the two gases. Contact angle and zeta potential measurement confirmed that the surface hydrophilicity and negative charge density of the plasma-treated AEMs improved significantly and variously, which were related to the difference of the feed gases. No obvious changes occurred in the electrical resistance and ED performance of the plasma-treated AEMs, compared with the pristine AEM. The antifouling performance of the plasma-treated AEMs for sodium dodecylbenzenesulfonate (SDBS) improved significantly. Moreover, the O₂-treated AEM exhibited better antifouling property than the N₂-treated AEM. Results indicated that the high surface negative charge of the O₂-treated AEM was crucial to the improvement of the antifouling performance for SDBS.

Keywords: Anion exchange membrane; Plasma treatment; Antifouling performance; Electro dialysis; Surface properties characterization

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