



Study for adsorption behaviors of emulsion oil on a novel ZrO₂/PVDF modified membrane

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ABSTRACT

Adsorption is one of the most important reasons for membrane fouling. In this study, adsorption of emulsion oil on a novel ZrO₂/PVDF modified membrane and the original PVDF membrane (OM) were compared. The adsorption behaviors between membranes and emulsion oil droplets were investigated by calculating the thermodynamics parameters, fitting adsorption isotherms and kinetic models, in addition to other influencing factors, such as the initial concentration and temperature. The experimental data showed that MM had a better anti-oil-adsorption performance than OM. The results indicated that the Temkin isotherm model was the most suitable to describe emulsion oil adsorption on membranes, which showed that the adsorption tended to be a multilayer adsorption on an inhomogeneous membrane. The thermodynamics parameters showed that physical adsorption was primary, and the adsorption forces between membrane and oil droplets were mainly physical adsorption forces. Moreover, a pseudo-first-order kinetic model produced the highest value of R^2 , which showed that the emulsion oil adsorption rate on the membrane was directly proportional to the difference in value between the equilibrium concentration and the instantaneous concentration.

Keywords: Emulsion oil; Adsorption behavior; Fouling; ZrO₂/PVDF membrane

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