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Study of membrane ageing and grafting mechanisms using electron paramagnetic resonance

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ABSTRACT

An important setback for a wider use of membrane processes in industry is fouling, caused by aggregation of biomolecules at membrane surface and pores. Two important approaches to reduce this effect are the use of chemical cleaning procedures and the functionalisation of the membrane surface. However, both processes may lead to membrane degradation and structure alteration due to free radical formation or radical interaction with membrane polymer chains. In this work, electron paramagnetic resonance (EPR) was used to evaluate and quantify radical formation in both chemical cleaning and membrane functionalisation by UV grafting, allowing for a better understanding of free radical formation processes and their influence on membrane characteristics. Studies under different cleaning and grafting conditions, such as, cleaning agent concentration and pH, light intensity and irradiation were also performed showing the potential of EPR as a technique for monitoring both procedures. The information provided by EPR may contribute significantly to the development of new cleaning strategies which minimise the effect of membrane ageing and to the implementation of new and more efficient grafting procedures.

Keywords: Membrane ageing; Membrane chemical cleaning; Membrane grafting; EPR; ESR

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