



Biofilm-based membrane reactors – selected aspects of the application and microbial layer control

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ABSTRACT

The membrane, a selective barrier, could serve also as a carrier for biofilm (a microorganism layer) immobilization. Then, it forms the so-called catalytic (active) membrane. The aim is to maintain a layer of controlled thickness and activity. The use of membrane as a biomass carrier is justified when the membrane performs an additional function. Such applications are discussed in the paper. Particular attention is given to the reactors in which microorganisms are immobilized on the membrane surface and the membrane simultaneously serves to provide substrate transport from a liquid and/or gas. The most interesting case is membrane oxygenation. The resulting different zones of aeration of biofilm allow simultaneous aerobic and anaerobic processes to occur in a single reactor. This integration can be applied in the treatment of any kind of municipal wastewater. A promising application of biofilms is their location on an ion-exchange membrane. In this case, catalytic membrane serves as a fuel cell. In the simplest solution, microbial fuel cells change the chemical energy collected in compounds (wastes, renewal biomass) into the energy necessary to support the biological functions of microorganisms and additionally create a supply of electrical energy. Keeping a stable thickness of the microbial layer is a key to provide the process at stable efficiency. Selected methods for *in situ* disposal of redundant biofilm are presented.

Keywords: Active (catalytic) membrane; Fuel cell; Membrane oxygenation; *In situ* biofilm control

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