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Membrane impedance porometry

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Abstract

In this work a new method named *impedance porometry* is described to determine the pore size distribution of microfiltration membranes without flow measurements. Instead, this method uses measurements of the electric (ion) current to quantify the number of pores of a certain size in which fluid displacement has taken place and ion conduction can take place. The impedance porometry method exhibits distinct advantages over classical flow porometry methods. First, the correlation used to determine pore size distributions from impedance measurements correlates to the transmembrane pressure by one power less (Δp^4) compared to the function using fluid flow (Δp^5). Therefore, it is less affected by errors in measuring as well as regulating the transmembrane pressure. Secondly, the proportionality factor, K_1 , between pore radius and fluid displacement pressure is two powers smaller (${K_1}^3$) compared to the one of conventional flow porometry methods (${K_1}^5$). And finally the impedance may be determined with 250 fold precision compared to flow rates. The mean pore radii determined with the new method are larger compared to the ones determined by conventional flow porometry.

By comparing hydraulic flow and electrical admittance measurements as well as comprehensively reviewing the literature of flow porometry and fluid displace-

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