

Closure characteristic of thermally responsive ion track membranes

Reber N, Omichi H, Spohr R, Wolf A, Yoshida M

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The surface of ion track membranes with single or many pores of cylindrical geometry were covered with poly-Nisopropylacrylamide. Given by the properties of this hydrogel, the opening and closing of the modified pores can be controlled by temperature. Above 31°C, in the shrunken state of the hydrogel, ions and molecules can freely pass through the membrane whereas below 31°C, in the swollen state, the hydrogel clogs the pore. The closure characteristic of single responsive pores for polyethylene glycol (PEG) molecules of various sizes was studied by electrical conductivity measurements. As demonstrated for single pores, the passage of PEG molecules larger than 2 nm is prevented in the closed state. Complementary experiments were performed with membranes containing between 10^6 and 5×10^7 pores per cm^2 . The flow for different molecules (methyleneblue, orange G and bovine albumin) was investigated by means of a dialysis cell. For different membranes with pores of an initial diameter of 0.6 and 3.5 μm , the flow through the membrane in the swollen state is completely blocked for the bovine albumin molecules. In the open state, both dye and albumin molecules could pass the 3.5 μm pores freely, whereas the flow ratio was considerably reduced for the 0.6 μm pores.