

Fabrication and functionalization of single asymmetric nanochannels for electrostatic/hydrophobic association of protein molecules

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We have developed a facile and reproducible method for surfactant-controlled track-etching and chemical functionalization of single asymmetric nanochannels in PET (polyethylene terephthalate) membranes. Carboxyl groups present on the channel surface were converted into pentafluorophenyl esters using EDC/PFP (N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride/pentafluorophenol) coupling chemistry. The resulting amine-reactive esters were further covalently coupled with ethylenediamine or propylamine in order to manipulate the charge polarity and hydrophilicity of the nanochannels, respectively. Characterization of the modified channels was done by measuring their current-voltage ($I - V$) curves as well as their permselectivity before and after the chemical modification. The electrostatic/hydrophobic association of bovine serum albumin on the channel surface was observed through the change in rectification behaviour upon the variation of pH values.