Charge-selective transport of organic and protein analytes through synthetic nanochannels

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Nanotechnology 21 (2010) 365701 (8pp)

We present an experimental demonstration of a synthetic nanoporous membrane suitable for charge-selective transport of ionic species. The surfaces and walls of synthetic nanochannels, fabricated in heavy ion-tracked polyethylene terephthalate membranes are negatively charged due to the presence of carboxylate moieties. These nanofilters discriminate and gate the transport of cations while inhibiting the passage of anions. The permselectivity of these membranes is reversed by converting the carboxylic moieties into terminated amino groups. The positively charged (aminated) membranes facilitate the transport of anions. Based on the same principle, charged biomolecules (bovine serum albumin and lysozyme) are successfully filtered through these membranes. These membranes also exhibit the phenomenon of ion concentration polarization.