

Ultrafast Permeation of Water through Protein-based Membranes

Here, we report a new type of filtration membrane made of cross linked proteins that are mechanically robust and contain channels with diameters of less than 2.2 nm. We find that a 60-nm-thick membrane can concentrate aqueous dyes from fluxes up to 9,000 l/h · m² · bar, which is about 1,000 times higher than the fluxes that can be withstood by commercial filtration membranes with similar rejection properties. Based on these results and molecular dynamics simulations, we propose that protein surrounded channels with effective lengths of less than 5.8 nm can separate dye molecules while allowing the ultrafast permeation of water at applied pressures of less than 1 bar.

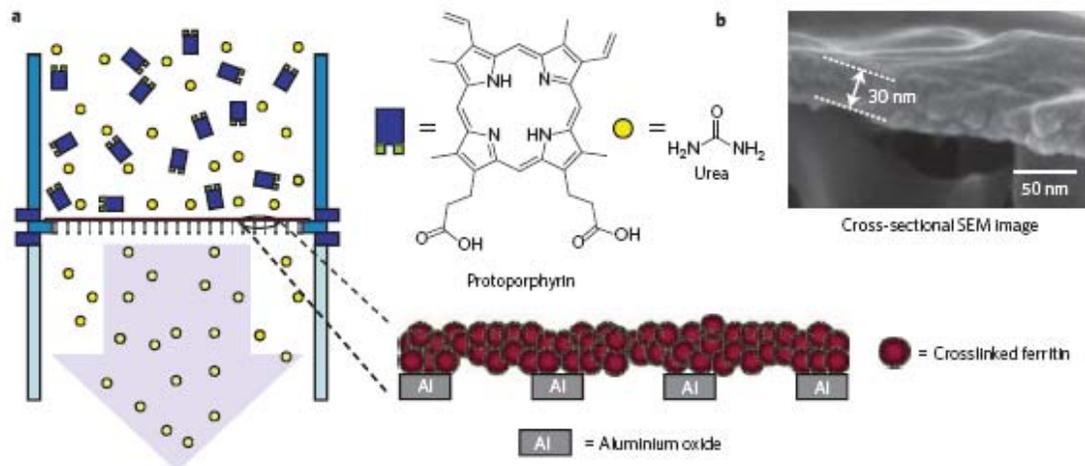


Illustration of the separation process