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Controlled Transport of Functionalized Nanochannel though Lipid Membrane MEENAKSHI DUTT, Dept of Chemical and Biochemical Engineering, Rutgers University, OLGA KUKSENOK, ANNA C. BALAZS, Chemical Engineering Dept, University of Pittsburgh — Via the Dissipative Particle Dynamics approach, we study the directed transport of a transmembrane nanochannel to a desired location within a lipid bilayer. Each nanochannel encompasses an ABA architecture, with a hydrophobic shaft (B) with two hydrophilic ends (A). One of the ends of the nanochannel is functionalized with hydrophilic functional groups, or hairs. The hydrophilic hairs serve a dual role: (a) control transport across the membrane barrier, and (b) enable the channel relocation to a specific membrane site. Our system comprises a lipid membrane with an embedded transmembrane nanochannel with the hairs extending into solution. First, we hold a suitably functionalized pipette above the membrane while the nanochannel freely diffuses within the membrane. For an optimal range of parameters, we demonstrate that the hairs find the pipette and spontaneously anchor onto it. We then show that by moving the pipette for a range of velocities, we can effectively transport the channel to any location within the membrane. This prototype assembly can provide guidelines for designing a number of systems for biomimetic applications.

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