

Abstract Submitted  
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**Membranes with charged nanopores from the assembly of random copolymer micelles**<sup>1</sup> AYSE ASATEKIN, Tufts University — In this study, we aimed to prepare synthetic polymer membranes that can separate small molecule solutes based on charge by mimicking biological pores like ion channels: Pores 1-5 nm in diameter, lined with functional groups that interact with the target. We found that random copolymers that combine highly hydrophobic fluorinated repeat units of trifluoroethyl methacrylate with ionizable repeat units of methacrylic acid form micelles and vesicles in methanol. When these micelles are coated onto the surface of a porous support membrane whose pores are smaller than the micelles and then immersed into water, a selective layer of micelles packed together is formed. The gaps between the micelles act as carboxylate-functional nanochannels. The membrane showed charge-based selectivity between organic molecules, rejecting anionic solutes while passing neutral ones. The carboxyl groups can be post-functionalized to alter the selectivity of the membrane for desired separations. This shows the potential of using polymer self-assembly and functionality to design membranes that mimic biological pores while maintaining scalable manufacturing methods. We believe these approaches will eventually lead to novel membranes that can separate molecules of similar size but different chemical structure.

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