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Solvent-phase electrodeposition of highly concentrated, vertically aligned carbon nanotubes for scalable fabrication of carbon-nanotube membranes RICHARD CASTELLANO, Rutgers University, ERIC MESHOT, FRANCESCO FORNASIERO, Lawrence Livermore National Labs, ROBERT PRAINO, Chasm Technologies, JERRY SHAN, Rutgers University — Membranes incorporating vertically aligned carbon nanotubes (VA-CNTs) as through-pores have been shown to transport fluids at rates orders-of-magnitude faster than predicted by theory, offering promise as highly permeable membranes for applications as diverse as protective yet breathable garments, and desalination membranes[1]. There is a need for cost-effective and scalable methods for fabricating VA-CNT membranes. Here, we describe a solution-based fabrication technique for VA-CNT membranes using electric-field alignment and electrophoretic concentration of CNTs initially dispersed in a solvent[2]. The quality of electrodeposition is described in terms of the resulting CNT number density. Multiple rounds of solvent-phase CNT alignment and deposition are performed, before the solvent is finally replaced with a UV-curable prepolymer, all while an electric field is applied to preserve CNT alignment. The liquid prepolymer is cured to form membranes, which are shown to have open CNT pores with flow enhancement. We compare the solution-fabricated VA-CNT membranes to those fabricated by other, less-scalable means, and discuss the implications for large-scale production of such membranes.

1. N. Bui, *et al.*, Adv. Mat. (2016)

2. R. J. Castellano, *et al.*, J. Applied Physics. (2015)

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