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A Microfluidic Platform for Interfacial Electrophoretic Deposition YOUNG SOO JOUNG, JEFFREY MORAN, ANDREW JONES, Massachusetts Institute of Technology, ERIC BAILEY, University of Maryland, CULLEN BUIE, Massachusetts Institute of Technology — Composite membranes of hydrogel and carbon nanotubes (CNTs) are fabricated using electrophoretic deposition (EPD) at the interface of two immiscible liquids in microfluidic channels. Microfluidic channels, which have two parallel electrodes at the walls, are used to create electric fields across the interface of oil and water continuously supplied into the channels. Depending on the Reynolds (Re) and Weber (We) numbers of oil and water, we observe different formations of the interface. Once we find the optimal Re and We to create a planar interface in the channel, we apply an electric field across the interface for EPD of CNTs and/or silver (Ag) nanorods dispersed in water. During EPD, particles migrate to the oil/water interface, where cross-linking of polymers is induced to form composite hydrogel membranes. Properties of the composite hydrogel films are controlled by electric fields, CNT concentrations, and both Re and We numbers, allowing for continuous production. This fabrication method is effective to create composite polymer membranes placed in microfluidic devices with tunable electrical, mechanical, and biological properties. Potential applications include fabrication of doped hydrogels for drug delivery, conductive hydrogels for biological sensing, and electron permeable membranes for water splitting and osmotic power generation.

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