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Templated Nanocarbon Black Nanocomposite Electrodes for Rechargeable Lithium Batteries OZGE AKBULUT, MIT, ELSA A. OLIVETTI, MIT, DONALD R. SADOWAY, MIT, ANNE M. MAYES, MIT — In this work, the fabrication of high energy density electrode materials for solid-state rechargeable batteries via block copolymer templating schemes was investigated. Atom transfer radical polymerization was used to synthesize the copolymer template poly((oligooxyethylene) methacrylate)-*block*-poly(butyl methacrylate), POEM-b-PBMA. Continuous, nanoscale phases of vanadium oxide were subsequently grown within the POEM domains of the microphase-separating block copolymer using sol-gel synthesis from a vanadium alkyoxide precursor. The in situ growth of cathodic components in ion-conducting POEM domains allows for control of morphology and increases the interface-to-volume ratio, thereby escalating the specific electrode area over which faradaic reactions can occur and decreasing ion diffusion distances within the electrode. Films incorporating up to 34 wt% V_2O_5 were flexible and semi-transparent. To achieve necessary electronic conductivity, the incorporation of nanocarbon black was investigated. Hydrophilic surface modification of carbon black nanoparticles provided a mechanism for their selective incorporation into POEM domains. Transmission electron microscopy (TEM) and small angle x-ray scattering (SAXS) were performed to probe the morphology of the nanocomposite electrodes.

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