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Magnetically aligned ion-transport polymer membranes[1] PAWEL MAJEWSKI, MANESH GOPINADHAN, CHINEDUM OSUJI, Yale University — We present the use of magnetic fields to direct the self assembly and impose long-range order in amphiphilic block-copolymers which can be utilized as solid electrolytes for ion-transport membranes or nanomaterials synthesis templates. Our approach allows us to produce highly aligned hexagonally packed cylindrical or lamellar polymer microdomains over macroscopic areas. We systematically explore the influence of several parameters; the strength of magnetic field used for alignment, lithium ion content and temperature on the conductivity of such membranes. A surprising order of magnitude increase in conductivity is found in films aligned in the conduction direction relative to the non-aligned case. The conductivity of field aligned samples shows a non-monotonic dependence on temperature, with a distinct decrease on heating in the proximity of the order-disorder transition of the system before increasing again at elevated temperatures in homogenous melt state. The data suggest that domain-confined ion transport in hexagonally packed cylindrical systems differs greatly in anisotropy compared to lamellar systems.

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