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Conducting Block Copolymer Battery Electrode Binders Compared Against Their Homopolymer Blend Analogs[1] HYOSUNG AN, Texas AM University, XIAOYI LI, Rice University, CODY CHALKER, MARIA STRACKE, Texas AM University, RAFAEL VERDUZCO, Rice University, JODIE LUTKENHAUS, Texas AM University — Electron- and ion-conducting block copolymers have been explored as battery electrode binders as a means to enhance both electrochemical and mechanical performance. The question remains as to whether the block copolymer architecture is truly necessary or how the block copolymer compares against an analogous homopolymer blend. Here, we explore this question by blending a diblock copolymer bearing electron- and ion-conducting blocks, poly(3-hexylthiophene)-*block*-poly(ethyleneoxide) (P3HT-*b*-PEO), with V_2O_5 to form a electro-mechanically stable hybrid electrode. These are compared against similar electrodes that contain P3HT and PEO homopolymers of similar molar mass. It is found that the homopolymer blends suffer from poor electrode morphology, leading to subpar performance. In contrast the diblock copolymer binder is superior as phase separation is discouraged and the electrode exhibits a more homogeneous structure. The electrode with P3HT-*b*-PEO has the highest capacity of 190 mAh/g, whereas V_2O_5 is only 77 mAh/g at a C rate of 0.1 after over 200 cycles. P3HT, PEO, and the blend have capacities of 139, 130, and 70 mAh/g, which are not nearly as impressive as the block copolymer binder.

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