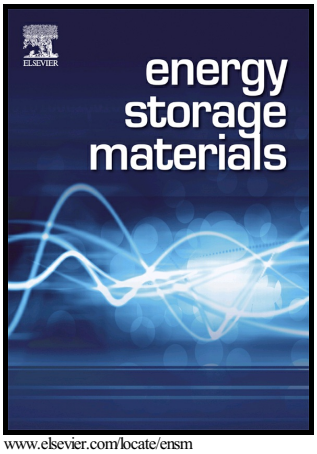

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A Polymer-Alloy Binder for Structures-Properties Control of Battery Electrodes

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Abstract

The microstructures of electrodes play a critical role in controlling the charge transport in electrode composites. Achieving uniform and stable microstructures for battery electrodes with aid of binder materials is an important task in battery research. Here, we propose a polymer alloy binder rich in amorphous structures to address the issue. This alloy binder is fabricated by complexing poly(vinylidene fluoride) and ultra-high molecular weight poly(ethylene oxide). Due to a good compatibility of the two polymers and the ultra-long chain of poly(ethylene oxide), it is found that the crystallization of each component is greatly suppressed and more amorphous phase is achieved. The amorphous structure of the alloy binder can dramatically improves the adhesion properties (by ca. 150%), structure uniformity and interface stability of the final electrode simultaneously, as compared with the electrodes with a traditional PVDF binder. As a result, the mechanical flexibility, electrolyte wettability, the electron/ion transport and electrochemical performance of the final electrodes are notably improved as compared with pure PVDF binder. This study brings about a cost-effective binder solution based on polymer alloys for controlling the microstructures/interfaces and properties of battery electrodes.

Graphic Abstract