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Improving Carbon Fiber Structural Battery Performance with Polymer Interface

Authors : Kathleen Moyer, Nora Ait Boucherbil, Murtaza Zohair, Janna Eaves-Rathert, Cary Pint

Abstract : This study demonstrates the significance of interface engineering in the field of structural energy by being the first case where the performance of the system with the structural battery is greater than the performance of the same system with a battery separate from the system. The benefits of improving the interface in the structural battery were tested by creating carbon fiber composite batteries (and independent graphite electrodes and lithium iron phosphate electrodes) with and without an improved interface. Mechanical data on the structural batteries were collected using tensile tests and electrochemical data was collected using scanning electron microscopy equipment. The full-cell lithium-ion structural batteries had capacity retention of over 80% exceeding 100 cycles with an average energy density of 52 W h kg−1 and a maximum energy density of 58 W h kg−1. Most scientific developments in the field of structural energy have been done with supercapacitors. Most scientific developments with structural batteries have been done where batteries are simply incorporated into the structural element. That method has limited advantages and can create mechanical disadvantages. This study aims to show that a large improvement in structure energy research can be made by improving the interface between the structural device and the battery.

Keywords : composite materials, electrochemical performance, mechanical properties, polymer interface, structural batteries
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