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Synthesis methods of borophene, graphene-loaded polypyrrole nanocomposites and their benefits for energy storage applications: A brief overview

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Abstract

The bane of energy sufficiency lies in the inability to harness and store the plethora of the world's renewable energies. Although many materials have been used in the development of electrochemical storage devices: low energy density, low power density, poor charging rate, as well as the cracking and fracture of the electrodes are some associated disadvantages of these devices. Efficient energy storage probably entails the use of polymers and their composites. The tunable properties of polymers, when coupled or as hybrids with other materials, make them inevitable energy storage materials. Although the viability of graphene-polymer (Gr-PPy) allotropes for energy storage has not been fully established, and borophene remains a victim of inadequate and undesirable synthesis approaches. Consequently, an overview of the progress of the synthesis technologies of PPy, Gr, borophene, and Gr–PPy composites for energy storage applications is presented herein. The reported result reveals that borophene has certain unique properties, which qualify it to be used as battery electrodes if an appropriate synthesis approach is adopted for the development of the material. Besides, Gr-PPy composites possess many of the desired properties that electrochemical energy storage materials require.