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Performance of bismuth-based materials for supercapacitor applications: A review

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Abstract

The supercapacitor, which has been attracting growing interest in energy-storage applications since the past decade, is an alternative that evinces the potential to emulate future battery technology. To achieve this decisive task, it is essential that electrode materials with high energy density and electrochemical stability are explored for environment-friendly and economical utilization. Numerous studies have been conducted on metal-based compounds and their composites; among them, bismuth-based materials and their composites are promising because of their redox behavior, charge storage capacity, environmental friendliness, and increasing research toward their application in energy storage for batteries and supercapacitor technologies. Herein, we outline bismuth materials and their composites, as investigated by researchers, highlight their applications in energy storage, and, more importantly, focus on the study of their supercapacitive performance via electrochemical techniques. To better understand their charge storage mechanism and electrochemical performance, we also present a summary of energy storage devices and their mechanisms, as well as other types of non-bismuth-based electrode materials available in the market. In addition, the major challenges and future perspectives of bismuth-based composites for energy storage purposes are discussed.