Transition metal chalcogenides, MXene, and their hybrids : An emerging electrochemical capacitor electrodes

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ABSTRACT

The amelioration of the human population and their reliance on energy-consuming devices have increased the global energy thirst, as well as the need for new, cleaner energy storage technology. Generally, storage devices are associated with batteries and fuel cells, but nowadays, supercapacitors are being used in laptops, cameras, cellphones, vehicles, and even airbuses, as they can quickly store a large number of charges and also have a long-life cycle and a large power density. However, they have a comparably lower energy density, which pragmatically binds their applications. Herein, we present a forward-looking review of 2D (two dimensional) TMDs (transition metal dichalcogenides) and MXene-based materials for their promising properties like unique electronics and tunable surface chemistry with their synthesis protocol, fundamental properties, and state-of-the-art electrochemical activity in supercapacitors. Finally, we discuss the challenges that restrict the electrochemical properties of pristine TMDs and MXene. And these problems have led to progress by encouraging the development of various derivatives and compositions of these materials to address these issues and improve their performance in emerging energy storage technologies.

KEYWORDS

Electrochemical capacitor; Hybrid; MXene; Physico-chemical properties; Supercapacitor; Synthesis methods; TMDs; Two-dimension

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