

Review: Two-dimensional layered material based electrodes for lithium ion and sodium ion batteries

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ABSTRACT

Energy crisis is a worldwide problem due to the current conventional resources which are depleting and are causing great environmental concerns. Among many feasible solutions, rechargeable batteries are considered as a powerful alternative to these conventional energy resources. Lithium and sodium ion batteries are one of the best energy storage systems which provide greater cyclic stability and better charge–discharge capacity. These metal ion batteries have achieved great attention and are being used in a range of applications from small electronic devices to electric vehicles. An overall enhancement of metallic ion storage and transportation is the current concern and focus of the researchers. Many electrode materials are tried and tested in this regard which provided great deal of structural and functional improvement. Two dimensional layered materials have also gained much attraction recently in energy storage application due to their higher surface to volume ratio. There are a number of layered structures which have been developed and electrochemically tested as anode or cathode for both lithium and sodium ion batteries. Materials like graphene based structures, transition metal chalcogenides (TMDCs), MXenes, nitrides, Molybdenum Sulfide and organic frameworks showed promising results as electrode for lithium and sodium ion batteries. In this work, an effort is done to cover all these electrode materials along with their complete structural analysis and a thorough evaluation of their electrochemical activity in energy storage systems.

KEYWORDS

Charge–discharge capacity; Efficiency; Electrode; Lithium-ion batteries; Sodium-ion batteries; Two dimensional layered materials

ACKNOWLEDGEMENTS

The author would like to thank the Ministry of Higher Education Malaysia for the financial aids and Universiti Malaysia Pahang and its staffs for the laboratory facilities and financial supports from the Fundamental Research Grants Scheme FRGS/1/2019/STG07/UMP/02/7 (University reference RDU1901205) and PGRS2003152.