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## A Critical Review on Multifunctional Composites as Structural Capacitors for Energy Storage

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### Abstract

Due to the increasing greenhouse gas emissions and gradual run out of fossil fuels, there is a growing concern on the environmental protections and global energy demands in the world. Therefore, new energy storage technologies have been continuously developed to be integrated with renewable energy systems in recent years. Nowadays, advanced composites are popular in automotive and aerospace industries because of their significant advantages such as high specific strength to weight ratio and non-corrosion properties. Therefore, research interests in developing multifunctional composite materials in order to reduce the fuel and energy consumption have increased significantly. Therefore, this paper is focused on the development of multifunctional energy storage systems. The introduction of structural dielectric capacitors and structural electric double layer capacitors (EDLC) are presented. Then, experimental findings, in terms of improvements on the mechanical and electrical properties of structural dielectric capacitors, and factors on the overall performance of structural EDLC conducted by other researchers are given. In addition, it has been proven that the structural dielectric capacitors could maintain their capacitive function under a mechanical loading. Lastly, challenges that would be faced in the realization of structural dielectric capacitors and structural EDLC are discussed.

**Keywords:** Advanced composites; Multifunctional; Energy storage; Carbon fibres

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