

What is the energy density of graphene supercapacitors?

In practice, the energy density of graphene supercapacitors achieved so far is between 15 and 35 Wh kg<sup>-1</sup>, and less than 60 Wh l<sup>-1</sup> -- far below the theoretical values. Figure 1: Graphene and supercapacitors.

Can graphene be used in energy storage?

Graphene has now enabled the development of faster and more powerful batteries and supercapacitors. In this Review, we discuss the current status of graphene in energy storage, highlight ongoing research activities and present some solutions for existing challenges.

What are graphene-based hybrid supercapacitors?

Recently, graphene-based hybrid supercapacitors capable of providing up to 42 Wh l<sup>-1</sup> have been reported 62. The advantage of these hybrid supercapacitors is that they work with aqueous electrolytes and can be produced in air without the need for expensive 'dry room' assembly.

Why is graphene a good material for supercapacitors?

The fundamental properties of graphene make it promising for a multitude of applications. In particular, graphene has attracted great interest for supercapacitors because of its extraordinarily high surface area of up to 2,630 m<sup>2</sup> g<sup>-1</sup>.

How can graphene supercapacitors improve volumetric performance?

This makes it possible to control the density of the graphene electrodes and thus improve the volumetric performance. These supercapacitors demonstrated ultrahigh energy densities of up to 60 Wh l<sup>-1</sup>, which is comparable to lead-acid batteries.

Why do supercapacitors use 2D graphene sheets?

In contrast to 2D graphene sheets, which readily aggregate during electrode fabrication, these structures have proven to be very useful in preventing the restacking of graphene, thereby leading to supercapacitors with larger specific capacitances and higher rate capabilities 5.

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