Energy Storage in Graphene: Batteries or Supercapacitors?

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Abstract

In the field of energy, and in particular for energy storage, graphene is a unique contender material and it has already been claimed as a champion material for supercapacitors providing large active area for capacitive double-layer storage but also for batteries, both as an additive to improve other electrode materials as well as active material in itself (normally as an anode9.
In this presentation we will briefly introduce the emergent and growing field of energy storage and the central role graphene and its hybrid derivatives are playing. Graphene itself promises an extraordinary large potential surface area and correspondingly a large double layer capacitance. In turn, graphene-based hybrid materials offer the opportunity of building synergies thus leading to improved performance over their individual components.[1] In that way, hybrids based on graphene and a variety of molecular species[2.3] or extended phases[4] have been used to design materials with enhanced activity. A wise choice of electroactive species can for instance improve the energy density of graphene-based supercapacitors through hybridization. On the other hand, graphene as anode in batteries has also been tested as a fast alternative to graphite. Furthermore, in our group we have gone beyond the conventional solid state electrode format and have developed graphene electroactive nanofluids as liquid electrodes for flow cells. This novel electrode format is also prone to the development of hybrid materials. In this conference the use of graphene and some hybrid derivatives, with some emphasis on our own group results will be presented in relation to energy storage, discussing supercapacitors, batteries and beyond

References

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