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Graphene for Energy Storage in Supercapacitors

Energy applications of graphene abound. In our laboratory we have explored both electrochemical and thermal properties of graphene in nanofluids and as solid electrodes with emphasis on energy storage applications. Electrochemical energy storage will be key to our ongoing transition to sustainable energy but is still far from optimal. That is why there is still plenty of room for new and novel types of materials in this trade. Graphene and its hybrids play an increasingly relevant role in this respect. In our laboratory we have researched hybrid materials and devices in order to improve power density of batteries and energy density of supercapacitors [1] We have explored various approaches for the integration of electroactive species in graphene electrode materials for supercapacitors, both in the electrodes [2] and the electrolyte [3]. In addition to composition and microstructure, we will present also recent efforts to advance in the design of low-cost devices of the class needed for the upcoming low-power energy storage revolution [4] concerning flexible/wearable devices and some of our designs on paper [5]. Finally, we will also present some recent results concerning other novel nanocarbon materials also used as electrodes for energy storage devices, both on their own [6] or in combination with Graphenes[7] (Figure1) and will discuss novel approaches towards flowing electrode materials.

References

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Figures

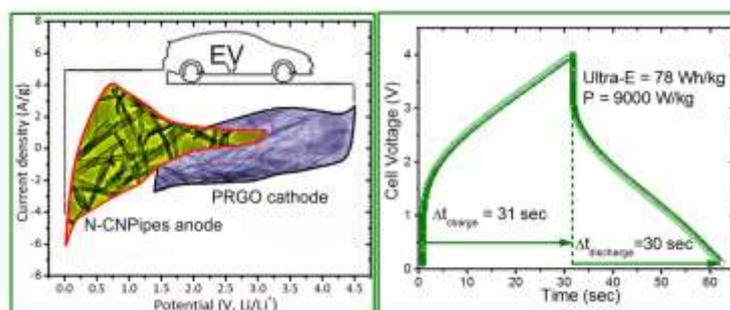


Figure 1: A hybrid device (Li-Ion Capacitor) formed by two different nanocarbon materials leading to high specific energy and power [7]