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Temperature dependent supercapacitive performance in La_2O_3 nano sheet decorated reduce graphene oxide

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Abstract

It is well known that high performance supercapacitor with high energy and power density is usually degrade at high temperatures. Therefore, to explore the thermal stability, temperature dependent study of supercapacitor is very useful. In the present work, La_2O_3 nanosheet decorated reduce graphene oxide is synthesized to use it as electrode material in high performance supercapacitor. Temperature dependent electrochemical behavior viz. charging discharging and current voltage (I-V) characteristics are studied to explore the thermal stability of the system. In comparison to pristine rGO, the specific capacitance of La_2O_3 decorated sample is found to increase by 158% at temperatures 30 ^oC and 205% at 70 ^oC respectively. The highest value obtained is 751 F/g at temperature 70 ^oC at a current density of 1 A/g. Remarkably the specific capacitance of hybrid electrode retains 78% of its original value at temperature 30 ^oC; conversely 67% of its original value even at higher temperature 70 ^oC after 2000 cycles. The enhancement of specific capacitance is explained by the charge transfer effect between rGO and La_2O_3 at the interface.