

Pyrrolic-structure enriched nitrogen doped graphene for highly efficient next generation supercapacitors

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This study reports the preparation of pyrrolic-structure enriched nitrogen doped graphene by hydrothermal synthesis at varied temperature. The morphology, structure and composition of the prepared nitrogen doped graphene were confirmed with SEM, XRD, XPS and Raman spectroscopy.

The material was tested for supercapacitive behaviour. It was found that doping with nitrogen increased the electrical double layer supercapacitance of graphene reaching a high value of 194 F/g. The electrode fabricated from the optimized condition is able to provide energy density as high as 26.9Wh/kg and a power density of 967.6 W/kg. Furthermore, molecular dynamic simulation proved the proper level of binding energy found between the pyrrolic-nitrogen structure and the electrolyte ions which may be used to explain the highest contribution of the pyrrolic-structure to the capacitance.

