Date Seeds Derived Phosphorus and Nitrogen Doped Graphene Oxide for Supercapacitor Applications

Al Qahtani, Naif (School: Abha Private School)

Supercapacitors are gaining importance in energy storage applications due to their portability, long cycle lifetime, high energy density, and power density. The purpose of this project is to utilize date seeds in supercapacitor manufacturing to reduce cost and environment issues after converting them into graphene oxide using Hummers' method. Chemical activation of date pit samples with phosphorus and nitrogen was carried out by using different concentrations of phosphoric acid and urea. Hummer's method was used to generate graphene oxide through the addition of potassium permanganate to a solution of graphite, sodium nitrate, and sulfuric acid. This commonly used by engineering and lab technicians as a reliable method of producing quantities of graphene oxide. In this experiment, it was employed for the purpose of graphene oxide production. The resulted graphene oxide has been characterized using EDX, XRD and SEM techniques. The supercapacitor samples were measured using a potentiostat on the samples via 3 techniques, CV, GCD and EIS. Optimization of the graphene oxide doped with phosphoric acid (65%) source of phosphorus gives the best result for supercapacitors at 27F/g, with a relative to low concentration of phosphoric acid, 25% at 20F/g. On the other hand, it was found that graphene oxide doped with a urea nitrogen source is also promising for supercapacitors. Production of supercapacitors can be made with local material inexpensively from date pit waste.

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