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Performance of Liquid Phase Exfoliated Graphene As Electrochemical Double Layer Capacitors Electrodes JACOB HUFFSTUTLER, MILINDA WASALA, JULIANNA RICHIE, ANDREW WINCHESTER, SUJOY GHOSH, Department of Physics, Southern Illinois University Carbondale IL-62901, USA, SWASTIK KAR, Department of Physics, Northeastern University, Boston, MA-02115, USA, SAIKAT TALAPATRA, Department of Physics, Southern Illinois University Carbondale IL-62901, USA — We will present the results of our investigations of electrochemical double layer capacitors (EDLCs) or supercapacitors (SC) fabricated using liquid-phase exfoliated graphene. Several electrolytes, such as aqueous potassium hydroxide KOH (6M), ionic 1-Butyl-3-methylimidazolium hexafluorophosphate [BMIM][PF_6], and ionic 1-butyl-1-methylpyrrolidinium tris(pentafluoroethyl)trifluorophosphate[BMP][FAP] were used. These EDLC's show good performance compared to other carbon nanomaterials based EDLC's devices. We found that the liquid phase exfoliated graphene based devices possess specific capacitance values as high as 262 F/g, when used with ionic liquid electrolyte[BMP][FAP], with power densities ($\sim$ 454 W/kg) and energy densities ($\sim$ 0.38Wh/kg). Further, these devices indicated rapid charge transfer response even without the use of any binders or specially prepared current collectors. A detailed electrochemical impedance spectroscopy analysis in order to understand the phenomenon of charge storage in these materials will be presented.

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