

EXECUTIVE SUMMARY OF MINOR RESEARCH PROJECT

Titled “Studies on Hybrid Electrode Configuration for Supercapacitor Application”

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In summary, Graphene oxide (GO) powder was synthesized successfully using Hummer's method. Secondly hydrothermal technique was developed and used to synthesize the Fe_2O_3 powder. This work confirmed the existence of oxygen as a functional group and presence of C-O and C=C bonds with sophisticated techniques such as XRD, FTIR respectively. Also confirms D and G bands by Raman spectrum of GO. The graphene sheets showed exfoliated and arranged in pattern. The GO was evaluated as electrode for supercapacitor. The highest specific capacitance was obtained 266 Fg^{-1} in KCl electrolyte. The GO showed good stability performance. Hydrothermally synthesized Fe_2O_3 powder for different concentrations was characterized by XRD and found hematite crystal structure. The morphology was strongly reliant on the concentration of solution and majorly influences the performance of the material utilized for supercapacitor. The wettability of Fe_2O_3 was tested in terms of contact angle. Fe_2O_3 and GO/ Fe_2O_3 electrodes were deposited by spray pyrolysis. The device performance of Fe_2O_3 was tested by CV technique. The specific capacitance of Fe_2O_3 at different concentration (0.05, 0.1 and 0.2M) showed 201, 152 and 124 Fg^{-1} at scan rates of 2 mVs^{-1} respectively. The 0.05M Fe_2O_3 showed high specific capacitance than 0.1 and 0.2M Fe_2O_3 .

The GO/ Fe_2O_3 were characterized by XRD, no conventional stacking peak (002) of graphene sheets at $2\theta=26.34^\circ$ is detected, suggesting that the graphene sheets may be individual mono-layers that are homogeneously dispersed. As Fe_2O_3 (0.05M) showed high specific capacitance, therefore, GO powder in 1, 2 and 3 wt% was mixed in 0.05M Fe_2O_3 and tested specific capacitance. The maximum specific capacitance value of 312 Fg^{-1} showed by GO/ $\text{F}_{0.05}$.

