$LiFePO_4$/C/reduced graphene oxide composite lithium ion battery cathode with improved rate capability

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The large specific surface area of graphene along with the superior electronic conductivity [1,2] suggests that graphene can be used as an additive for improving electronic conductivity in various composites, including lithium ion battery electrodes. $LiFePO_4$ is a lithium ion battery cathode material with a particularly low electronic conductivity. An increase in the overall $LiFePO_4$ cathode electronic conductivity can lead to significant improvement of its electrochemical properties [3]. However, little is known regarding the optimal morphology and grain structure of $LiFePO_4$/reduced graphene oxide (rGO) composites.

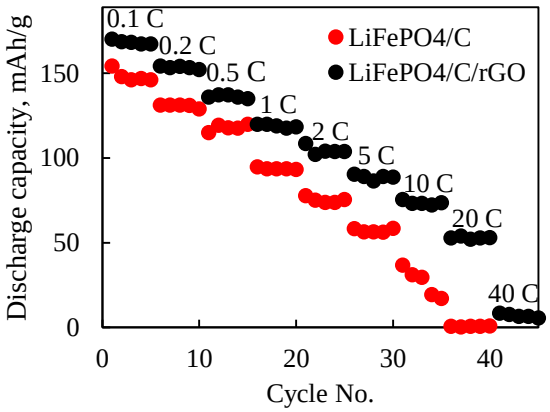

Fig.1 Rate capabilities of $LiFePO_4$/C and $LiFePO_4$/C/rGO composites

In this work $LiFePO_4$/C/rGO composites were synthesized by adding rGO and GO (graphene oxide) followed by thermal reduction at various steps of the $LiFePO_4$/C synthesis obtaining composites with various grain structures and morphologies. The addition of rGO and GO improved the rate capability in all cases. The superb rate capability of $LiFePO_4$/C/rGO composite can be seen in figure 1. However, it was determined that the optimum mixing of $LiFePO_4$/C and rGO can be obtained by adding GO during the initial stages of $LiFePO_4$/C synthesis. This ensured better $LiFePO_4$/C anchoring on the rGO sheets due to the hydrophilic nature of GO, therefore improving the electrical inter-particle contact and providing superior rate capability when compared to other $LiFePO_4$/C/rGO composites.

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