Poster Presentation

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rGO/MnO_x/SnO_y nanocomposite in organic pollutant removal and electrochemical energy storage

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Graphene, monoatomic layer of graphite, with its unique properties has created a revolution in materials chemistry on the nanoscale in the 21st century. Graphene or its most commonly produced form, reduced graphene oxide (rGO) based nanocomposites, particularly those with metal oxides has added a new dimension in this craze with their buoyant performance in various critical area of our interest, particularly in environmental pollution and energy storage crisis [1]. rGO/MnOx and rGO/SnOy binary nanocomposites with their low cost, easy synthesis and environmental benignity, constitute some of the ideal examples in this regard [2-3]. Consequently, the rGO based ternary nanocomposites of these metal oxides deserves attention for synthesis and analysis to judge their suitability in the aforementioned fields. However, unlike many others, there have been no report so far in this regard. In our present work, we have synthesized rGO/MnOx/SnOy ternary nanocomposite in a three-step method. According to FTIR, XRD and FESEM analysis, the nanocomposite consist of cubic MnO and tetragonal Mn3O4 and SnO2 adorned on reduced graphene oxide sheet. Organic pollutant removal behavior of the nanocomposite was studied at 30°C with methylene blue as a model dye solution by visible spectroscopy analysis. The ternary nanocomposite showed maximum adsorption capacity at acidic pH and at pH=3 it was 17.7 mg/g and it was found to be more effective at its lower dosage. The electrochemical energy storage performance was evaluated in a three-electrode system in 0.5 M Na2SO4 solution. Cyclic voltammetry and chronopotentiometry of the ternary nanocomposite showed that, within 0-1 V, at 0.5 A/g, it has a specific capacitance of 145.6 F/g. In cyclic stability study, the nanocomposite required almost same charging time compared to its discharging time and retained 84% capacitance, even after 500 cycles. In impedimetric analysis, the nanocomposite showed very low charge transfer resistance. Thus, the ternary nanocomposite possess a good potential to be used in organic pollutant removal as well as a medium of electrochemical energy storage.

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