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FABRICATION OF GRAPHENE ZERO VALENT IRON ANODE MATERIALS FOR ELECTROCOAGULATION WATER TREATMENT FACILITY

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Electrocoagulation (EC) is promising technology in the treatment of excess fluoride and hardness in water. In this technique, the coagulant (Al^{3+}/Fe^{2+}) is generated in situ as the anode material corrodes under the applied potential. Apart from the merits of the EC, passivation of the anode, residual Al^{3+} in treaded water and scaling on the cathode are major issues to be addressed. Iron and its associated species are environmentally benign, therefore, we fabricated graphene zero valent iron composite in place of Al anode. The preparation of graphene oxide was carried out by a modified Hummers method. Under facile conditions, one step reduction method was used to synthesis the graphite – Fe(0) composites through green tea leaves and sodium borohydride reductants (GO – 1:Green tea reduced Fe^{2+} graphene oxide; GO-2 $NaBH_4$ Fe^{2+} reduced graphene oxide). 2D Raman bands appeared at 2715 cm^{-1} for GO-1confirm the presence of multilayer structure while the bands at 2680 cm^{-1} for GO-2 confirm the presence of the single layer structure of graphene. The point of zero charge (pH_{pzc}) measurement of GO-1 and GO-2 samples were found to be 8.71 and 8.58 respectively. The FTIR spectroscopic data obtained for graphene –Fe (0) attribute the removal of oxygen baring functional groups during the reduction process. The vibrational absorption bands correspond to -C=O groups have considerably decreased but the band at 1620 cm^{-1} remains constant. The X-ray Diffraction (XRD) pattern of graphene –Fe (0) suggests not only the presence of zero valent iron, but also iron oxide. Thermogravimetry (TG) analysis showed that the graphene – Fe - (0) composite has much lower thermal stability than natural graphite.

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