Synthesis of a Conductive Pt-Bi/CAG composite and its application for Methyl Orange Decolorization

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To improve the electrochemical properties of electrodes and reduce their cost, a special multi-layer matrix was synthesized as an electrode material, which was composed of cement, active carbon (AC), and graphite with Pt-Bi co-deposition (Pt-Bi/CAG). Pt-Bi particles were found to be homogeneously distributed on the surface of the GAC electrode according to the SEM, EDS and XRD patterns, and the Pt-Bi/CAG-G5 electrode, which was made up of 5% graphite, 20% AC powder, 25% cement and 50% water, showed the best electrochemical performance in terms of specific capacitance, corrosion resistance and catalytic performance. The specific capacitance of the Pt-Bi/CAG-G5 electrode was 1.103 times larger than that of the Pt-Bi/CAG-G7.5 electrode, and the corrosion resistance was slightly lower than that of the Pt-Bi/CAG-G0 electrode. The current density was appreciably larger than those of all other electrodes, and it was 1.5 times larger than that of the Pt-Bi/CAG-G7.5 electrode. Next, the electrode was optimized based on methyl orange (MO) decoloration experiments, and approximately 76.62% of the decoloration rate was obtained by the Pt-Bi/CAG-G5 electrode, with a corresponding TOC removal rate of 54.80% in 180 min under a square wave potential (E_U 1.5 V, E_L -1.5 V). This composite electrode provides a cost-efficient application using electrochemical technologies (ETs) for the removal of refractory compounds.

Keywords: cement/AC/graphite electrode; electrochemical properties; multi-layer-matrix; cost-efficiency

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