Removal of potassium permanganate from water by modified carbonaceous materials

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ABSTRACT

Potassium permanganate is commonly used in multidiscipline processes as a strong oxidizing agent for oxidative treatment of a great number of organic and inorganic compounds. In this work, a method is proposed for removal of KMnO4 from aqueous solutions and real water samples using treated and activated carbon (AC) sorbents with sulfuric acid. The potential applications of five modified AC sorbents for removal of KMnO4 were explored under different experimental controlling factors including pH, contact time, initial concentration of KMnO4, sorbent dosage, and competing ions by the batch equilibrium technique. The removal values of KMnO4 were found to be ≥99.56% in the examined solutions (pH 1.0–7.0). In pH 1.0–2.0, KMnO4 removal from aqueous solutions was found to proceed by an anion exchange and ion pair interaction mechanisms, while in pH ≥ 3.0–7.0, the uptake of KMnO4 was identified to take place by an initial surface reduction step for the formation of Mn(II) ion and followed by adsorption via a direct complex formation with the AC surface functional groups. The proposed method confirmed an efficient removal of ≥99% of residual KMnO4 from industrial wastewater, seawater, and drinking water in laboratory trials.

Keywords: Potassium permanganate; Carbonaceous materials; Removal

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