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Decolourization of Methyl Orange (MO) by electrocoagulation (EC) using iron electrodes under a magnetic field (MF)

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ABSTRACT

This work aims to treat the decolourization of methyl orange (MO) by the electrocoagulation (EC) method with application of a magnetic field (MF) (EC-MF). Experimentally, the electrochemical cell consists of two iron electrodes, which are kept at 2 cm with an active surface of 12.5 cm^2. The main experimental parameters, including supporting electrolyte, current density, pH and MO concentration, are optimized. After 12 min, the rate of MO decolourization by EC-MF reached its maximum (95%) which is higher than that obtained with EC (74%) at pH 7.25 with a current density of 64 A/m^2. The XRD analysis proved the presence of hematite Fe_2O_3 in the formed flocs. The SEM/EDX analysis confirmed the presence of iron and oxygen in the flocs. The removal mechanism suggested that MO be reduced to sulfanilic acid and 2-naphtol. The energy consumption was decreased from 28 to 19 kWh/kg of MO, for EC process and EC-MF, respectively. The obtained results depict that the application of the MF in the EC process is one of the most promising methods of increasing removal efficiency, accentuating process compactness and lowering energy consumption. More research is still needed to open the process of industrial application perspectives.

Keywords: Electrocoagulation (EC); Methyl orange (MO); Magnetic field (MF); Iron; Decolourization; Scanning electron microscopy (SEM); X-Ray diffraction (XRD); Supporting electrolyte (SE)

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