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An Innovative Use of Flow Columns in Electrocoagulation Reactor to Control Water Temperature

Authors : Khalid S. Hashim, Andy Shaw, Rafid Alkhaddar, David Phipps, Ortoneda Pedrola

Abstract : Temperature is an essential parameter in the electrocoagulation process (EC) as it governs the solubility of electrodes and the precipitates and the collision rate of particles in water being treated. Although it has been about 100 years since the EC technology was invented and applied in water and wastewater treatment, the effects of temperature on the its performance were insufficiently investigated. Thus, the present project aims to fill this gap by an innovative use of perforated flow columns in the designing of a new EC reactor (ECR1). The new reactor (ECR1) consisted of a Perspex made cylinder container supplied with a flow column consisted of perorated discoid electrodes that made from aluminium. The flow column has been installed vertically, half submerged in the water being treated, inside a plastic cylinder. The unsubmerged part of the flow column works as a radiator for the water being treated. In order to investigate the performance of ECR1; water samples with different initial temperatures (15, 20, 25, 30, and 35 °C) to the ECR1 for 20 min. Temperature of effluent water samples were measured using Hanna meter (Model: HI 98130). The obtained results demonstrated that the ECR1 reduced water temperature from 35, 30, and 25 °C to 24.6, 23.8, and 21.8 °C respectively. While low water temperature, 15 °C, increased slowly to reach 19.1 °C after 15 minutes and kept the same level till the end of the treatment period. At the same time, water sample with initial temperature of 20 °C showed almost a steady level of temperature along the treatment process, where the temperature increased negligibly from 20 to 20.1 °C after 20 minutes of treatment. In conclusion, ECR1 is able to control the temperature of water being treated around the room temperature even when the initial temperature was high (35 °C) or low (15 °C).

Keywords : electrocoagulation, flow column, treatment, water temperature
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