Methylene Blue decolorization and Mineralization by Means of Electrochemical Technology at Pre-pilot Plant Scale: Role of the Electrode Material and Oxidants

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In this work, a synthetic effluent containing methylene blue has been treated by electrochemical oxidation (EO) process at pre-pilot plant scale using a filter-press electrochemical cell reactor. Electrochemical experiments were carried out using Ti/Pt and Ti/IrO₂-Ta₂O₅ anodic materials in the presence or absence of chloride ions to study the influence on the decolorization and mineralization of the different oxidant species electrogenerated *in situ*. The electrochemical experiences have been carried out at different applied current densities ($j = 20, 40$ and 60 mA cm^{-2}) to evaluate the effect of this controlling parameter on the degradation efficiency and the operational energy consumption. Under optimal treatment conditions of 40 mA cm^{-2} in 0.05 M of Na₂SO₄ at pH 6.0, solutions of 100 mg L^{-1} of methylene blue were completely decolorized obtaining 86.0 % of COD abatement after 360 min of electrolysis. The determination of energy consumption allowed to estimate operational costs about $13.36 \text{ US\$ m}^{-3}$. The results obtained provide valuable information regarding the EO process scaling-up, aiming the application of electrochemical technologies to treat actual effluent at real scale.

Keywords: dyes, dimensional stable anodes (DSA), wastewater treatment, anodic oxidation, electrochemical advanced oxidation processes (EAOPs),

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