Advanced treatment of coking wastewater by heterogeneous photo-Fenton technology with Cu/Fe oxide catalysts

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ABSTRACT

This study presents an evaluation of catalytic performances of Cu/Fe oxides containing TiO\textsubscript{2}/Al\textsubscript{2}O\textsubscript{3} for the coking wastewater advanced treatment through heterogeneous photo-Fenton. Fe and Cu were loaded by the impregnation method, and the tests were carried out in a three-phase fluidized bed photo reactor. The prepared catalysts were characterized by SEM, XPS, and BET. The results showed that the catalytically active materials in the fabricated catalyst are iron and copper oxides FeOOH, Fe\textsubscript{2}O\textsubscript{3}, CuO, and Cu\textsubscript{2}O. The catalyst showed high activity in a neutral environment without any pH adjustment in the coking wastewater advanced treatment. The focus of this method was on COD and TOC removal efficiencies. The results showed that higher COD and TOC removal rates were achieved with a longer reaction time and an increased dosage of H\textsubscript{2}O\textsubscript{2} and catalyst. In a neutral environment, with 14.68 mmol/L H\textsubscript{2}O\textsubscript{2} and 1.0 g/L catalyst, approximately 65% COD and TOC removal was obtained in 2.0 h. In this current work, the conditions were changed during the continuous reaction process, and the reaction system reached equilibrium in a shorter amount of time. These results imply the great potential of the heterogeneous photo-Fenton system in engineering applications, such as an advanced treatment of coking wastewater.

Keywords: Coking wastewater; Heterogeneous photo-Fenton; Fe/Cu oxide catalysts; Advanced treatment

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