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Sequence-Fenton Reaction for Decreasing Phenol Formation during Benzene Chemical Conversion in Aqueous Solutions

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Abstract:

Advanced oxidation processes such as Fenton reagent generates highly reactive hydroxyl free radicals to oxidize various compounds in the water and wastewater. The efficiency of different Fenton-related oxidative processes such as Fenton, solar-Fenton, UV-Fenton and Fenton reactions in different batch reactors was examined using benzene as pollutant in aqueous solutions. A batch study was conducted to optimize parameters like pH, hydrogen peroxide concentration, temperature, reaction time and ferrous ion concentration governing the Fenton process. The concentrations of produced phenol were measured at the end of the reactions. The role of sequence reaction was tested for decreasing phenol formation during benzene conversion. At optimum conditions, different Fenton-related processes were compared for the degradation of benzene. Increased degradation efficiency was observed in photo-Fenton processes as compared to conventional Fenton process. The formation of phenol in Fenton reaction depended on reaction time, sequence in reaction, purity of hydrogen peroxide and other compounds such as alcohols that contributed into the reaction. In the Fenton process, carboxylic acids like acetic acid and oxalic acid were formed as the end products during the complete degradation of benzene. With the increase in mono-valence, two-valence ions and hardness, Fenton's efficiency decreased, respectively. Sequence Fenton reaction produced less phenol and its end products had smaller COD as compared to conventional Fenton process.

Keywords:

Benzene ، Fenton process ، Sequence-Fenton processes ، Aqueous solutions

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