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Peroxide degradation of azo dye using hydrothermally synthesized Cu-L zeolite as high performance catalyst

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ABSTRACT

Cu-L zeolites synthesized hydrothermally with various Cu contents were characterized by X-ray diffractometer, SEM, and Fourier transform infrared, and their catalytic performance was evaluated using Acid Scarlet as a model compound. The effects of various parameters such as Cu content, temperature, initial pH, catalyst, and H_2O_2 dosage, initial dye concentration, and inorganic salts on the degradation of dye were studied. The results showed that adjusting Cu content could result in high catalytic activity, and Cu species highly dispersed in the channels of zeolite L played a crucial role in the catalytic activity. The diffusion limitation and adsorption of lager Acid Scarlet molecule did not influence the degradation. For the best catalyst, Acid Scarlet of 400 mg/L could be degraded effectively in 120 min at 50 °C under low catalyst and low H_2O_2 dosage. The degradation could be carried out in a wide pH range. Under near-neutral conditions the catalyst showed the highest catalytic activity. The existence of NaCl or Na_2SO_4 obviously decreased the initial rate of Acid Scarlet degradation, but did not influence the eventual decolorization efficiencies significantly. The catalyst appeared to have good stability and less Cu was leached out during the dye degradation.

Keywords: Hydrothermal synthesis; Cu-L zeolite; Advanced oxidation process; Azo dye; Peroxide degradation; Diffusion limitation

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