Photodegradation of dimethyldisulfide by heterogeneous catalysis using nanoCdS and nanoCdO embedded on the zeolite A synthesized from waste porcelain

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ABSTRACT

Photodegradation of dimethyldisulfide (DMDS) was examined using nanoCdS and nanoCdO loaded on zeolite A as a heterogeneous catalyst under UV irradiation. Zeolite A was prepared from waste porcelain. Cadmium sulfide nanoparticles were prepared by a precipitation method using zeolite A as a template. Finally, CdO/A was prepared by wet impregnation of parent zeolite NaA with Cd(NO₃)₂ solution. Fourier transformation infrared, X-ray diffraction, and scanning electron microscopy methods were applied for the characterization of samples. UV–Vis spectrophotometric measurements were performed to determine the extent of decolorization and mineralization. Considering the influence of experimental parameters such as catalyst concentration, DMDS concentration, and pH of the test solutions, the contaminant photoelimination process was studied. The optimal operation parameters were found as follows: pH 1, 0.3 g L⁻¹ of catalyst loading, and 8 ppm of DMDS concentration. Based on the obtained results in the photodegradation process of DMDS, the most efficiency was detected in the presence of nanoCdS/A, while no remarkable activity was perceived when bulkCdS was used as the photocatalyst. CdO/A and nanoCdS particles also showed relatively good activities in the photodegradation extent of the contaminant. The degradation process obeyed first-order kinetics.

Keywords: Dimethyldisulfide; CdS nanoparticles; CdO; Photodecolorization; Zeolite A; Heterogeneous catalysis; Waste porcelain

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