Photocatalytic performance of carbon-containing cumo-based catalysts under sunlight illumination

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Abstract
Carbon-doped nanostructured CuMo-based photocatalysts were prepared by solvother-mal synthesis. Two thermal treatments—oxidative and inert atmosphere—were used for the synthesis of the catalysts, and the influence of spherical carbon structures upon the crystalline phases on the photocatalytic activity and stability was studied. XRD showed the catalysts are nanostruc-tured and composed by a mixture of copper (Cu, Cu2O, and CuO) and molybdenum (MoO2 and MoO3) crystalline phases. The catalysts were used for the degradation of yellow 5 under solar light. A remarkable leaching of Mo both in dark and under solar irradiation was observed and quantified. This phenomenon was responsible for the loss of photocatalytic activity for the degradation of the dye on the Mo-containing series. Conversely, the Cu-based photocatalysts were stable, with no leaching observed after 6 h irradiation and with a higher conversion of yellow 5 compared with the Mo-and CuMo series. The stability of Cu-based catalysts was attributed to a protective effect of spherical carbon structures formed during the solvothermal synthesis. Regarding the catalysts' composition, sample Cu4-800-N2 prepared by pyrolysis exhibited up to 4.4 times higher photoac-tivity than that of the pristine material, which is attributed to a combined effect of an enhanced surface area and micropore volume generated during the pyrolytic treatment due to the presence of the carbon component in the catalyst. Scavenger tests have revealed that the mechanism for tar-trazine degradation on irradiated Cu-based catalysts involves successive attacks of •OH radicals. © 2022 by the authorsLicensee MDPI, Basel, Switzerland.

Author keywords
Carbon spheres; CuMo catalysts; Leaching effect; Solar photocatalysis; Yellow 5 degradation