

عنوان مقاله:

Exploring the Photocatalytic Activity of Mn & Al Incorporated MCM-41 towards the Removal of Rhodamine B and Congo Red Dyes under Visible Light and their Kinetic Study Service Unavailable

محل انتشار:

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خلاصه مقاله:

Manganese and Aluminum incorporated mesoporous silica materials (Mn & Al-MCM-41) were synthesized using the co-precipitation method. They have been characterized using XRD, SEM-EDX, FTIR, surface area (SBET, $m^2.g^{-1}$), and UV-Vis DRS spectral studies. The spectral analysis explored that the mesoporosity was retained even after the acid functionalization of materials. There was a significant fall in the surface area (SBET, $m^2.g^{-1}$), pore size (\AA), and pore volume ($cc.g^{-1}$) on merging Mn and Al atoms into the skeleton of MCM-41. Their light absorption was found to be profound in the visible light as observed from the UV-Vis DRS analysis, and pertaining to these results, their suitability as photocatalysts were examined towards the oxidative removal of a xanthene (Rhodamine B) and an azo dye (Congo red). Scavengers experiment revealed that both OH^\bullet (hydroxyl radicals) and $O_2^{\bullet-}$ (superoxide radical ions) were the active oxidative species in the removal of the dyes. In the kinetic profile analysis, the rate of removal of the dyes was found to meet the Langmuir-Hinshelwood (L-H) kinetic model. Manganese and Aluminum incorporated mesoporous silica materials (Mn & Al-MCM-41) were synthesized using the co-precipitation method. They have been characterized using XRD, SEM-EDX, FTIR, surface area (SBET, $m^2.g^{-1}$), and UV-Vis DRS spectral studies. The spectral analysis explored that the mesoporosity was retained even after the acid functionalization of materials. There was a significant fall in the surface area (SBET, $m^2.g^{-1}$), pore size (\AA), and pore volume ($cc.g^{-1}$) on merging Mn and Al atoms into the skeleton of MCM-41. Their light absorption was found to be profound in the visible light as observed from the UV-Vis DRS analysis, and pertaining to these results, their suitability as photocatalysts were examined towards the oxidative removal of a xanthene (Rhodamine B) and an azo dye (Congo red). Scavengers experiment revealed that both OH^\bullet (hydroxyl radicals) and $O_2^{\bullet-}$ (superoxide radical ions) were the active oxidative species in the removal of the dyes. In the kinetic profile analysis, the rate of removal of the dyes was found to meet the Langmuir-Hinshelwood (L-H) kinetic model.

کلمات کلیدی:

mesoporous silica, photocatalysis, scavengers, Rhodamine B, Congo red

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