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# Synthesis of Montmorillonite/CuxCd1-xS Nanocomposites and Their Application to the Photodegradation of Methylene Blue

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**Abstract :** Synthetic organic dyes are used in various industries, such as textile industry, leather tanning industry, paper production, hair dye production, etc. Wastewaters containing these dyes may be harmful to the environment and living organisms. Therefore, it is very important to remove or degrade these dyes before discharging them into the environment. In addition to standard technologies for the degradation and/or removal of dyes, several new specific technologies, the so-called advanced oxidation processes (AOPs), have been developed to eliminate dangerous compounds from polluted waters. AOPs are all characterized by the same chemical feature: production of radicals (•OH) through a multistep process, although different reaction systems are used. These radicals show little selectivity of attack and are able to oxidize various organic pollutants due to their high oxidative capacity (reduction potential of HO• Eo = 2.8 V). Heterogeneous photocatalysis, as one of the AOPs, could be effective in the oxidation/degradation of organic dyes. A major advantage of using heterogeneous photocatalysis for this purpose is the total mineralization of organic dyes, which results in CO2, H2O and corresponding mineral acids. In this study, nanomaterials based on montmorillonite and CuxCd1-xS with different Cu concentration ($0.3 < x < 0.7$) were utilized for the degradation of the commercial cationic textile dye Methylene blue (MB), used as a model pollutant. The synthesized nanomaterials were characterized by fourier transform infrared (FTIR) and thermogravimetric-differential thermal analysis (TG–DTA). Test results of photocatalysis of methylene blue under UV-Visible irradiation show that the photoactivity of nanomaterials montmorillonite/ CuxCd1-xS increases with the increasing of Cu concentration. The kinetics of the degradation of the MB dye was described with the Langmuir–Hinshelwood (L–H) kinetic model.

**Keywords :** heterogeneous photocatalysis, methylene blue, montmorillonite, nanomaterial
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