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Nanocomposite based molecular sieve, a green, highly efficient and recyclable catalyst for the reduction of medicine

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Water pollution has led to various diseases that have resulted in severe health issues and increased mortality of humans and aquatic life [1]. Therefore, to solve the problems that emanated from wastewater contamination, pharmaceutical industries came up with different classes of drugs that could improve the deteriorating health conditions of the affected population. Meanwhile, the untreated discharge of effluents from pharmaceutical industries, hospitals, and sewers, has increased the contamination of surface and groundwater [2, 3]. Different materials have been used for treatment of pharmaceutical drugs in wastewater. We used highly ordered mesoporous molecular sieves AlMCM-41 and its new nanocomposite with mixed metal nanooxide to remove and degradation of this pollution. The nanocomposite was charachterized by Fourier transform infrared (FT-IR) spectroscopy, X-ray diffraction (XRD), , scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), and N_2 adsorption desorption analyses were used to examine the structure, morphology, size and phase composition of the synthesized nanocomposites. The results show the successful deposition of metal oxides nanoparticles onto the framework of AlMCM-41. AlMCM-41 provides enormous benefits such as environmentally safe, economic viability and porosity when used as support for metal oxide nanoparticles. The excellent catalytic activities of nanocomposites were investigated for the reduction of metronidazole and tetracycline in water at ambient temperature.The best observed performance of reduction of these contaminants with 100% conversion occurred within 6 min. The nanocomposite could be recycled and reused up to five times without noticeable change in its structure and activity.

Keywords: nanocomposite, mesoporous compound, metronidazole, tetracycline

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