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Optimization of activated carbon-Carbon nanotubes -ZnO nanoparticles to remove organic contaminants in waste-water

Abstract:

In the present work, the obtaining of carbon-based materials is shown, which exhibit physical, chemical, morphological and thermal properties of interest for adsorption applications. To manufacture these materials, it began with obtaining activated carbon (AC) using orange peel (OP) as raw material. The CA from the OP has properties of high surface area and greater porosity than the raw material; In addition, a variety of chemical groups present on the surface. Activated carbon is a versatile material, so the choice of activating agent and activation parameters are chosen depending on the characteristics required according to the application. ZnO nanoparticles were used to modify the activated carbons (AC) and/or commercial multiwalled carbon nanotubes (MWCNTs), in different amounts for the removal of methylene blue (MB) in aqueous solutions. These materials were characterized by XRD, FTIR, BET, TGA, SEM and UV-vis to determine the chemical, structural, and morphological properties and kinetic removal. From the results, it was determined that 20 mg of carbon-based materials can remove up to 89.5±4.47% of MB (80 ppm) after 24 h of exposure at a regulated pH of 8. The equilibrium adsorption data were better fitted by a Langmuir isotherm (R2= 0.9999) than the Freundlich model (R2=0.9366); showing in the best case a maximum adsorption capacity of 1250 mg g-1 for both materials with 30 wt.% of ZnO NPs (AC-MWCTs or MWCNTs). Experimental data also suggest that the most likely mechanism is chemisorption followed by physical adsorption.

Biography

Torres-Huerta complete her Postdoctoral degree at the Institute of Materials -National Autonomous University of Mexico, UNAM (2006-2007). Doctorate in Metallurgy and Materials from ESIQIE -National Polytechnic Institute, IPN (2004), Master of Science with Specialization in Chemical Engineering (1999) and Bachelor's Degree in Industrial Chemical Engineering (1994) from the same institution. Experience in the use of agroindustrial waste, biodegradable polymers and nanomaterials for energy applications, as well as in leadership of technological developments. She has published more than 130 articles reputed journals and has served as member of repute editorial board. She served as director of research and promote innovation at the IPN.