Loading $H_3PW_{12}O_{40}$ on aminopropylsilanized spinel-type cobalt oxide (Co_3O_4-$SiPrNH_2$/$H_3PW_{12}O_{40}$): A novel nanohybrid adsorbent for ~~the removal of~~removing cationic organic dye pollutants and Pb(II) ions from aqueous solutions

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applied organometallic chemistry

Abstract: In this work, phosphotungstic acid ($H_3PW_{12}O_{40}$; PW_{12}) was chemically anchored on aminopropylsiloxane functionalized spherical Co_3O_4 nanoparticles (Co_3O_4–$SiPrNH_2$) and the resultant nanocomposite (Co_3O_4–$SiPrNH_2$/PW_{12}) was fully characterized. The results demonstrated successful ancohring of PW_{12} on the surface of Co_3O_4–$SiPrNH_2$ nanoparticles. The Co_3O_4–$SiPrNH_2$/PW_{12} nanohybrid ~~showed~~ indicated a specific surface area of 42.14 m^2 g^{-1}, ~~that~~ which was ~~more~~ greater than that of pure PW_{12} (ca. 5 m^2 g^{-1}). The adsorption efficiency of this novel adsorbent nanomaterial was evaluated for ~~the removal of~~removing methylene blue (MB), rhodamine B (RhB) and methyl orange (MO), and also Pb(II) ion from aqueous solutions ~~was evaluated~~. The hybrid nanomaterial exhibited a high adsorption rate and selective ~~adsorption ability~~adsorptivity for the cationic MB and RhB dyes compared to ~~that~~ those for anionic MO dyes. The prepared nanocomposite removed over 98% of MB with in 12 min. The effects of initial pH, contact time, adsorbent dosage, and temperature were investigated on the adsorption process ~~were investigated~~. The adsorption capacity of nanohybrid for cationic MB dye and Pb(II) was 38.46 and 55.55 mg g^{-1}, respectively. Also, ~~Adsorption~~ adsorption kinetics indicated that the adsorption by Co_3O_4–$SiPrNH_2$/PW_{12} ~~is~~ was well-modeled using pseudo-second-order kinetic model. Finally, ~~Thermodynamic~~ thermodynamic parameters ~~illustrated~~ revealed that the adsorption was endothermic and spontaneous.

Keywords: Aminosilanized cobalt oxide; Phosphotungstic acid; Dye pollutants; Lead (II) removal; Novel hybrid adsorbent.

EDIT-ACADEMY

1. INTERODUCTION

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Water pollution is one of the most ~~severe~~ serious public health issues worldwide.[1] Uncontrolled industrial development leads to disposal of many organic compounds