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MAGNETO-SENSITIVE CARBON-INORGANIC COMPOSITES BASED ON PARTICLEBOARD AND PLYWOOD WASTES

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Abstract. A study of conversion of metal-modified (Fe, Co) sawdust into magneto-sensitive porous carbons using thermal carbonization process in an inert atmosphere has been reported. Furniture wastes derived from particleboard and plywood were used as raw precursors. The as-prepared materials were characterized using nitrogen adsorption, X-ray diffraction, scanning electron microscopy and thermal analysis methods. The effects of metal precursors on the structure and morphology of metal-carbon nanocomposites as well on their magnetic properties were investigated. The results show that the structural and morphological characteristics depend strongly on the metal precursor's types. The specific surface area of micro-mesoporous chars was ≈ 58, 328, and 391 m^2/g for Fe/C, Co/C, and FeCo/C composites, respectively, at the total pore volume of ca. 0.2 cm^3/g. The efficiency of the composites in dyes sorption was studied. The unmodified sawdust carbon exhibited nonporous structure at S_{BET}= 4 m^2/g and very low adsorption capacity. The maximum adsorption capacity of the composites was in the range of 2.8-31 mg/g and depended strongly on the textural characteristics of adsorbents. All samples exhibited soft magnetic properties with the saturation magnetization of 6.6, 53, 13.5 Am^2/kg for iron-, cobalt-containing and binary samples, respectively. The magneto-sensitive materials have proven to be effective sorbents, which can be used for contaminant concentrations from aqueous solutions.

Keywords: sawdust, activated carbon, carbon-metal composite, magnetic nanoparticle, magneto-sensitive sorbent.