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Heavy metal ions adsorption from waste waters using phosphonate metal organic frameworks

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The combination of the surface areas and microporosity increase the attention in the area of phosphonate metal organic framework and allows the preparation of coordination polymers with enhanced properties, exemplified with a variety of applications. Due to the large amount of industrial activity throughout last period of time, heavy metal contamination of the natural environment has become a serious problem. Water pollution caused by heavy metal ions is a main fear due to their toxicity to numerous life forms. Consequently it is important to develop new and efficient method of heavy metals removal from aqueous solutions. Phosphonate metal organic frameworks were obtained in our labs by the reaction of divalent inorganic salts ($CoSO_4.7H_2O$, $Ni(CH_3COO)_2.4H_2O$), phosphonic acid (phosphonoacetic (CP), N,N-bis(phosphonomethyl) glycine (GLY) and vinylphosphonic (VP)) in hydrothermal conditions. The synthesized compounds were characterized by FTIR, x-ray crystallography and thermogravimetric analysis. These materials were used in the removal process of some metal ions from aqueous solutions in order to determine the possibilities of their use as adsorbent materials. In this purpose a well quantity of studied materials were treated with solutions containing a concentration of 10 mg/L Me^{n+} (Pb^{2+}, Cr^{6+}) in a solid: liquid ratio S:L=0.05:25. The effects of pH, metal ion initial concentrations and contact time upon the adsorption properties were investigated. From the experimental data it can be observed that the cobalt materials like Co-Gly developed a higher adsorption capacity for lead metal ions than the Co-VP and Co-CP, increasing following Co-CP<Co-VP<Co-Gly trend while the adsorption efficiency of the studied materials in the removal process of Cr(VI) ions from aqueous solutions was higher for nickel materials is in the following order: Ni-CP<Ni-Gly≤Ni-VP.

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