Effect of pH on Adsorption of Lead(II) and Copper(II) Ions onto Natural Sepiolite from Aqueous Solutions

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Lead(II), copper(II) and many of other heavy metals cause to the environmental pollution, which is one of the major environmental problems in many countries. Several traditional techniques such as oxidation or reduction, solvent extraction, evaporation, ion exchange, filtration, reverse osmosis, related to the removal of heavy metals are available, but these techniques are very expensive and ineffective. One of the alternative methods of metal/heavy metals removal may be the adsorption process, which is lower cost and more feasible. The widely used adsorbent in the adsorption studies is activated carbon, which is a high surface area and high adsorption capacity towards to many of pollutants, but it shows disadvantages of high operating costs and problems with regeneration. This led to a search directed at developing low cost and locally available adsorbing materials such as clay minerals including montmorillonite, bentonite, sepiolite and smectite. For this respect, sepiolite is chosen as an adsorbent for the experiments since it is locally available in Eskişehir/Turkey and is very cheap.

In this study, the effect of pH on adsorption of lead(II) and copper(II) ions onto natural sepiolite was investigated in aqueous solution in a batch system. The functional group characterization of sepiolite was done using the FTIR spectroscopic technique. The pH experiments were done at 100 mg dm⁻³ and 20°C for sepiolite. The maximum adsorption capacity obtained from pH experiments was found to be as 30.92 mg g⁻¹ and 67.27 mg g⁻¹ at pH=5.5 for copper(II) and lead(II) ions, respectively. The results indicate that sepiolite could be employed as low-cost material for the removal of textile dyes from effluents.