

Nickel Removal from Industrial Wastewater by Eucalyptus Leaves and Poplar Ashes

Authors : Negin Bayat, Nahid HasanZadeh

Abstract : Effluents of different industries such as metalworking, battery industry, mining, including heavy metal are considered problematic issues for both humans and the environment. These heavy metals include cadmium, copper, zinc, nickel, chromium, cyanide, lead, etc. Different physicochemical and biological methods are used to remove heavy metals, such as sedimentation, coagulation, flotation, chemical precipitation, filtration, membrane processes (reverse osmosis and nanofiltration), ion exchange, biological methods, adsorption with activated carbon, etc. These methods are generally either expensive or ineffective. Therefore, many researchers attempted to find cost-effective methods for removing pollutants and contaminants from wastewater. In recent years, considerable attention has been given to the removal of heavy metal ions from solution by adsorption using discarded and low-cost materials. In this study, nickel removal using an adsorption process by eucalyptus powdered leaves and poplar ash was investigated. This is an applied study. The effect of various parameters on metal removal, such as pH, amount of adsorbent, contact time, and stirring speed, was studied using a discontinuous method. This research was conducted in aqueous solutions on the laboratory scale. Then, optimum adsorption conditions were obtained. Then, the study was conducted on real wastewater samples. In addition, the nickel concentration in the wastewater before and after the adsorption process was measured. In all experiments, the remaining nickel was measured using an atomic absorption spectrometry device at 382 nm wavelength after an appropriate time and filtration. The results showed that increasing both adsorbent and pH parameters increase the metal removal rate. Nickel removal increased at the first 60 minutes. Then, the adsorption rate remained constant and reached equilibrium. A desired removal rate with 40 mg in 100 ml adsorbent solution at pH = 9.5 was observed. According to the obtained results, the best adsorption rate was observed at 40 mg dose using combination of eucalyptus leaves and poplar ash in this study, which was equal to 99.76%. Thus, this combined method can be used as an inexpensive and effective adsorbent for the removal of nickel from aqueous solutions.

Keywords : adsorption, wastewater, nickel, poplar ash, eucalyptus leaf, treatment

Conference Title : ICW 2024 : International Conference on Wastewater

Conference Location : Amsterdam, Netherlands

Conference Dates : December 02-03, 2024