

ADSORPTION OF CADMIUM, COPPER AND LEAD ONTO ACTIVATED CARBON PREPARED FROM TEA-INDUSTRY WASTE

Ali GÜNDOĞDU¹, Celal DURAN¹, Duygu ÖZDEŞ¹, Hasan Basri SENTÜRK¹,
Mustafa İMAMOĞLU², Mustafa SOYLAK³

¹Karadeniz Technical University, Faculty of Arts & Sciences, Department of Chemistry, Trabzon, Turkey,

²Sakarya University, Faculty of Arts & Sciences, Department of Chemistry, Sakarya, Turkey

³Erciyes University, Faculty of Arts & Sciences, Department of Chemistry, Kayseri, Turkey
(senturk@ktu.edu.tr; Tel: 0462 3772498, Fax: 0462 3253196)

Key Words: Tea-industry waste, Activated carbon, Removal, Heavy metals, Adsorption

Activated carbons (AC) are the most promising adsorbents for removal of various environmental pollutants, such as heavy metals, dyestuffs and organics, due to their high surface areas and porosities [1]. Nowadays, there is growing interest in the production of activated carbons from low-cost agricultural by-products. Turkey is one of the black tea manufacturers in the world. Approximately 30.000 tones/year tea wastes are produced in Turkey alone and not used for any purpose [2]. In this study, a new activated carbon was produced from a low-cost waste material, tea-industry waste (TIW), by chemical activation using sulfuric acid.

The performance of TIW-AC was tested on removal of some heavy metals; Cd, Pb and Cu. The effects of some analytical conditions including initial solution pH, contact time, adsorbent dosage, initial metal ion concentration etc. were investigated. Batch experiments were conducted by using polyethylene centrifuge tubes kept at a constant temperature (20 °C) for a period of 4.0 h shaking. The reaction mixture consisted of 30 mg of TIW-AC and a known initial concentration of metal ions in a total volume of 10 mL. The desired pH was adjusted before the experiments. After reaching equilibrium, the adsorbent was removed by vacuum filtration through 0.45 µm nitrocellulose membranes, and then the equilibrium concentration of metal ions in the filtrate was determined by flame atomic absorption spectrometry (FAAS).

Optimum working pH was evaluated as 5.0 for Cd and Cu, and 4.0 for Pb (Figure 1). The adsorption kinetic data can be described well with pseudo-second-order model and the equilibrium data can be well fitted using Langmuir model for all metal.

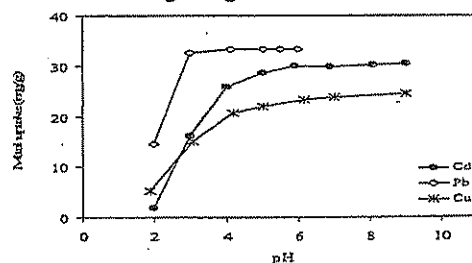


Figure 1. Effect of pH on the metal uptake

References

1. Paraskeva, P., Kalderis, D., Diamadopoulos, E. Production of Activated Carbon from Agricultural By-products, *J Chem Technol Biotechnol*, 83:581-592, 2008.
2. Çay, S., Uyanık, A., Özaşık, A. Single and Binary Component Adsorption of Copper(II) and Cadmium(II) from Aqueous Solutions Using Tea-industry Waste, *Sep. Purif. Technol.* 38:273-280, 2004.