OMICS International
conferenceseries.com SciTechnol

3rd International Conference on
Earth Science & Climate Change
July 28-30, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

Adsorptive removal of basic blue 99 dye by industrial wastes: Analysis of the equilibrium state

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Tea-based industries are big consumers of tea worldwide and deal with tons of spent tea leaves every year. Spent green tea (GT), peppermint (PM), chai tea (CT), decaffeinated green tea (DGT) leaves and alginate gel beads (AB) were used as adsorbents ofa hair dye to purify aqueous solutions. Basic Blue 99 (BB99) was chosen as a model dye due toits widespread use in the cosmetics industries. Dyes have a negative impact in water life as they are silent pollutants that increase the oxygen demand in water and inhibit photosynthesis. Equilibrium parameters such as pH, mass of adsorbent, initial dye concentration, presence of crowding agent and salinity were studied to maximize the adsorption of the dye from aqueous solution in discontinuous experiments at room temperature.Experimental data indicate that adsorption of BB99 is maximized in slightly acidic conditions (pH between 4 and 6), with optimum adsorbent masses of 50mg for PM, 75mg for CT, GT and DGT, and 100mg for AB. The adsorbents also reached their highest adsorption in the absence of salts and crowding agent with maximum initial concentrations between 0.18 and 0.3g/L of the dye. All adsorbents were able to remove more than 80% of the dye from the solution, where AB reached an adsorption percentage of 95%.Finally, desorption of the dye was studied to recycle the adsorbents in repetitive adsorption cycles. BB99 was desorbed by using diluted HCl solutions. Instrumental analysis included thermogravimetric analysis, scanning electron microscopy and FT-infrared spectroscopy and demonstrated the presence of optimum thermal, chemical and morphological conditions for the use of these materials as adsorbents of dyes. We believe this "clean" technology will educate us to take advantage of inexpensive waste materials to improve water quality.

Biography

Abel E Navarro received his PhD degree in Biomolecular Chemistry at New York University. Now, as a Junior Faculty at BMCC, he is developing new bioremediation alternatives for the elimination of pollutants from wastewaters. His work also includes chemical modification of adsorbents and production of different adsorption sites to improve the affinity between pollutants and adsorbents. He has a publication record of more than 30 papers in specialized and peer-reviewed journals and has participated in several conferences. He also serves as reviewer in many journals across the world.

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