

Efficient Removal Of Toxic Bromothymol Blue And Methylene Blue From Wastewater By Polyvinyl Alcohol

Shilpi Agarwal^a, Hamidreza Sadegh^b, Majid Monajjemi^c, Abdel Salam Hamdy^d, Gomaa A.M. Ali^{e,f}, Amir O.H. Memar^b, Ramin Shahryari-ghoshekandi^b, Inderjeet Tyagi^f, Vinod Kumar Gupta^{a,g},

^aDepartment of Applied Chemistry, University of Johannesburg, Johannesburg, South Africa

^bYoung Researchers and Elites Club, Science and Research Branch, Islamic Azad University, Tehran, Iran

^cDepartment of Chemistry, Science and Research Branch, Islamic Azad University, Tehran, Iran

^dDept. of Manufacturing and Industrial Engineering, College of Engineering and Computer Science, University of Texas Rio Grande Valley, 1201 West University Dr., Edinburg, TX 78541-2999, USA

^eFaculty of Industrial Sciences & Technology, Universiti Malaysia Pahang, Gambang, 26300 Kuantan, Malaysia

^fChemistry Department, Faculty of Science, Al-Azhar University, Assiut 71524, Egypt

^gDepartment of Chemistry, Indian Institute of Technology Roorkee, Roorkee 247 667, India

ABSTRACT

Removal of bromothymol blue (BTB) and methylene blue (MB) from wastewater using polyvinyl alcohol (PVA) has been elucidated in the present work. PVA exhibited high adsorption capacity and more active sites for the highly efficient removal of these toxic dyes. The impact of several variables such as concentration, contact time, pH and temperature were studied. The optimum pH and contact time for the high efficient removal were found to be 6 and 10 min, respectively. The adsorption isotherms were well interpreted by Freundlich and Langmuir models. The maximum adsorption capacities obtained from Langmuir model were 276.2 and 123.3 mg g⁻¹ for BTB and MB, respectively. In addition, the removal efficiencies for both adsorbates respectively, were found to be 98.65 and 61.32%. Several adsorption kinetic models were used to fit the experimental data, such as simple first-order, the pseudo-first-order, pseudo-second-order and intraparticle diffusion models. The adsorption process concurrently adapted to the pseudo-second-order kinetics and it was found to be the best fitting model with the obtained experimental data.

KEYWORDS: Adsorption; Kinetic models; Polyvinyl alcohol; Bromothymol blue; Methylene blue; Wastewater treatment

DOI: [10.1016/j.molliq.2016.02.060](https://doi.org/10.1016/j.molliq.2016.02.060)