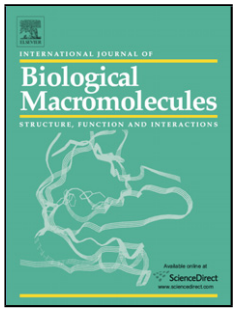

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Fabrication of Semisynthetic Collagenic Materials for Mere/Synergistic Adsorption: A Model Approach of Determining Dye Allocation by Systematic Characterization and optimization

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Highlights

- Synthesis of collagenic material and systematic characterization loaded adsorbents
- Synergistic/mere removal of acidic/basic dyes
- Comprehensive determination of dye allocations within microstructures
- Metachromasia, H-/J-aggregate, dye-dye-collagen adduct, orientation effect
- Studies of kinetics/thermodynamics/isotherm and diffusion mechanism

Abstract

Bovine collagen was functionalized by extensive process modifications for fabricating tanned bovine collagen fibers (TBCFs), as a new semisynthetic macro-, meso- and micro- porous adsorbent, of unprecedented physicochemical properties and excellent industrial waste removal efficiency. Mere or interactive effects were rationally understood, via analyzing monomer-dimer equilibrium, H-/J-aggregate formation, H-bonding, metachromasia, dye-dye complex formation etc., through extensive UV-Vis analyses, during removal of acidic, like Acid Brown 369 (AB369), Acid Red 131 (AR131) and Acid Blue 113 (AB113) and basic, like Methylene Blue (MB) dyes. A new strategy was introduced to determine the allocations of these dyes, within macro-, meso- and micro-pores of TBCF, confirmed by FTIR, TGA, DTG, DSC, XRD, SEM, EDX analyses, of both loaded and unloaded TBCFs, and by measuring isotherm, kinetics, diffusion and thermodynamics parameters of adsorption. Freundlich, Langmuir and Sips models were best fitted to AR131, AB113 and AB369, respectively. Interactive effects of concentration, temperature and time on adsorption capacities (ACs) were optimized via response surface methodology (RSM). ACs of AR131, AB113 and