Adsorption of non-steroidal anti-inflammatory drugs (diclofenac and ibuprofen) from aqueous medium onto activated onion skin

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\textbf{A B S T R A C T}

Diclofenac (DCF) and ibuprofen (IBP) adsorption onto acids (HCl, H\textsubscript{2}SO\textsubscript{4}, and H\textsubscript{3}PO\textsubscript{4}) pre-treated onion skin (OS) was studied as a function of pH, adsorbent dosage, drugs initial concentrations and contact time. The H\textsubscript{2}SO\textsubscript{4}-OS (adsorbent) showed higher drugs adsorption efficiency followed by H\textsubscript{3}PO\textsubscript{4}-OS and HCl-OS and NAT-OS (native). The drugs loaded and un-loaded OS were characterized by energy dispersive X-ray and scanning electron microscope techniques, which revealed a considerable change in OS composition and changed surface morphology. Pseudo-second-order kinetic model fitted well to both the drugs adsorption data. Freundlich isotherm explained well the drugs adsorption onto OS adsorbents. The optimum conditions of pH, adsorbent dosage and contact time were 6.5, 0.05 mg/g and 220 min, respectively. At optimum condition, the DCF and IBP adsorptions were 134.003 and 91.99 mg/g, respectively, which were 81.90\% and 65.99\% removal of the initial concentrations. Results revealed that OS pre-treated with mineral acids is a potential adsorbent and could possibly be used for the remediation of drugs wastewater.

\textit{Keywords:} Onion skin; Mineral acid pre-treatments; Anti-inflammatory drugs; Surface morphology; Elemental composition

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