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Kinetic and Thermodynamic Studies for Ciprofloxacin Hydrochloride Adsorption from Aqueous Solution on CuO Nanoparticles**[1]

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Abstract: Adsorptionisthemostversatile andwidelyused method fortheremoval ofpollutantsduetoits high efficiency andeaseof operation atlargescale. In recent years nano metal oxides havebeenextensively used for the removal of pharmaceutical pollutants from waste water. In the present study, the adsorption behaviour of ciprofloxacinhydrochloridefrom aqueous medium, using CuO nanoparticles (synthesized by precipitation method)has been studied using batch experiments. The nanoparticlesare characterized using X-Ray Diffraction, U.V and TEM. The average particle size, as determined from the XRD data, is 19.96 nm.The effectsof initial drug concentration in the range 10-100mg/l, contact time 15-165 mins.pH entire rangeand the effect of temperature in the range 25^0–45^0Con the adsorption capacity have been studied.

Maximum removal 81.5% has been observed at pH 4 for a contact time of 135 min and drug concentration 100 mg/l, with an adsorbent dose of 100mg/10ml at temperature 298 K. Data obtained at optimum conditions have been subjected to isothermmodelingvizFreundlich, Langmuir, Temkin and Dubinin-Radushkevitch. The experimental data fits well to all the isotherm models with high correlation coefficient values.The experimental data fits to the first order rate equation and process follows first order kinetics. A study of intraparticle diffusion using the Morris Weber model shows that intraparticle diffusion occurs but is not the rate determining step. Thermodynamic parameters suggest the process to be exothermic and spontaneous with increased randomness at the solid solution interface.

Keywords: Adsorption, Batch studies, Isotherm analyses, Kinetics, Thermodynamic parameters.

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