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# Adsorption characteristics of tetracycline antibiotics from aqueous solution onto graphene nanoplatelets: Equilibrium, kinetic and thermodynamic studies

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**ABSTRACT**

A systematic study of the adsorption characteristics of commercial graphene nanoplatelets for tetracycline antibiotics (such as tetracycline, oxytetracycline, and chlortetracycline) was performed by varying pH, ionic strengths, contact time, temperature, and initial concentrations. Meanwhile, isothermal, kinetic and thermodynamic constants were also determined. The experimental results indicated that graphene is a potential effective adsorbent for tetracycline antibiotics with high adsorption capacity of up to 207.2 mg $g^{-1}$ for tetracycline, 240.4 mg $g^{-1}$ for chlortetracycline and 232.7 mg $g^{-1}$ for oxytetracycline from aqueous solutions. The solution pH in the range of 4–8 had a minor effect on the adsorption of three antibiotics. The adsorption kinetics of three antibiotics was found that the equilibrium was reached within 30 min following the pseudo-second-order model with high correlation coefficients (>0.99). The adsorption data could be well fitted by the Langmuir model. Moreover, the calculation of thermodynamic parameters indicated that the adsorption process of three antibiotics onto graphene nanoplatelets was the endothermic and spontaneous nature.

*Keywords:* Graphene; Tetracycline; Oxytetracycline; Chlortetracycline; Adsorption

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