

研究论文

固定化脲酶催化作用下双醛纤维素对尿素氮的吸附平衡和动力学

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摘要 研究了在固定化脲酶催化作用下双醛纤维素对尿素氮的吸附平衡和动力学. 吸附过程符合Langmuir方程, 为单分子层化学吸附. 考察了双醛纤维素的氧化度、初始尿素氮浓度、

双醛纤维素与固定化脲酶的质量比和温度等对双醛纤维素吸附尿素氮的影响,

结果表明上述因素对尿素氮的吸附均有较显著的影响. 实验数据能很好地拟合准二级吸附速率方程,

说明该吸附过程遵从二级动力学模型. 当氧化度为88%的双醛纤维素与固定化脲酶的质量比为10: 1,

尿素氮浓度为 $638.3 \text{ mg}\cdot\text{L}^{-1}$ 时, 由Arrhenius方程求得表观吸附活化能为 $6.0 \text{ kJ}\cdot\text{mol}^{-1}$, 该吸附过程为吸热反应.

关键词 [吸附平衡](#) [动力学](#) [尿素氮](#) [双醛纤维素](#) [固定化脲酶](#)

分类号

Adsorption Equilibrium and Kinetics of Urea Nitrogen onto Dialdehyde Cellulose under Catalysis of Immobilized Urease

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Abstract The adsorption of urea nitrogen onto dialdehyde cellulose (DAC) under catalysis of immobilized urease in gelatin (IU) was studied in batch system. The equilibrium of urea nitrogen adsorption onto DAC with different degree of oxidation (DO) and the kinetics of adsorption with respect to the DO of DAC, the initial urea nitrogen concentration, temperature and DAC/IU weight ratio were investigated. Equilibrium data were fitted very well to the Langmuir mode in the entire saturation concentration range, indicating that the adsorption was of monomolecular layer and chemical adsorption. The DO of DAC, initial urea nitrogen concentration, temperature and DAC/IU weight ratio affected significantly the adsorption capacity. The experimental data were fitted well to the second-order kinetic mode, indicating that the adsorption process followed the second-order kinetic mode. The rate constants were evaluated, with the apparent activation energy of $6.0 \text{ kJ}\cdot\text{mol}^{-1}$ for the adsorption of the urea nitrogen onto DAC under catalysis of IU at DO 88% of DAC, initial urea nitrogen concentration $638.3 \text{ mg}\cdot\text{L}^{-1}$ and DAC/IU weight ratio 10: 1.

Key words [adsorption equilibrium](#) [kinetic](#) [urea nitrogen](#) [dialdehyde cellulose](#) [immobilized urease](#)

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