

化学

孔径和比表面积调控对SBA-15上溶菌酶吸附动力学的影响

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摘要:

研究具有不同孔径和比表面积的介孔二氧化硅SBA-15对溶菌酶的吸附行为, 并分析了材料孔径和比表面对吸附性质的影响. 研究结果表明: 材料对溶菌酶的最大吸附量受控于材料的比表面积, 关系式为 $q=0.60253S_{BET}-130.58$; 用3种吸附动力学模型分析溶菌酶的吸附动力学过程, 发现吸附行为符合准二级动力学模型; 用外部扩散传质模型和粒内扩散模型分析吸附机理, 在一定孔径范围内, 整体吸附速率和外扩散初始吸附速率随孔径的增加而快速增大, 粒内扩散速率则缓慢增加; 此外, FT-IR表明SBA-15对溶菌酶的结构无影响.

关键词: SBA-15 溶菌酶 吸附动力学 粒内扩散

Effects of Regulation of Specific Surface Area and Pore Diameter on Adsorption Kinetics of Lysozyme on SBA-15

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Abstract:

The adsorption behavior of lysozyme (LYZ) on SBA-15 mesoporous silica with different pore diameters and specific surface areas was investigated. Adsorption capacities of LYZ were controlled by the specific surface area, and the relationship between the adsorption and the special surface area is $q=0.60253S_{BET}-130.58$. Adsorption kinetic processes were analyzed with three kinds of adsorption reaction models. It was shown that adsorption kinetics followed the pseudo second order model very well. Adsorption mechanism was analyzed with intraparticle diffusion and simplified external mass transfer diffusion model. The adsorption rates were dependent upon the pore diameter of mesoporous materials. In certain ranges of pore diameters, the overall adsorption rate and initial adsorption rate of external diffusion increased quickly while intraparticle diffusion rate increased slowly. It was also suggested that SBA-15 did not affect the lysozyme structure evidenced by FT-IR analysis.

Keywords: SBA-15 lysozyme adsorption kinetics intraparticle diffusion

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