

论文

SO₂在活性炭表面的吸附平衡和吸附动力学

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摘要:

基于固定床反应器研究烟气中SO₂在活性炭表面的吸附平衡和吸附动力学。结果表明: 活性炭吸附SO₂在初始阶段呈现较快的吸附速率, 该阶段和表面吸附有关; 随着吸附的进行, 表面活性位逐渐被占据, 吸附速率下降, 粒内扩散起主要作用; 在接近吸附饱和阶段, SO₂吸附量增加缓慢, SO₂吸附与H₂SO₄的脱附有关。与2 mm活性炭相比, 0.075 mm活性炭呈现较快的SO₂吸附速率和较高的吸附量; 随着SO₂体积分数的增加, SO₂初始吸附速率和平衡吸附量增加。SO₂在活性炭上的动态吸附符合Bangham吸附动力学模型。用Langmuir和Freundlich吸附等温线模型拟合吸附数据, 发现Freundlich模型能够很好地预测SO₂在活性炭表面的吸附平衡。

关键词: SO₂; 活性炭; 吸附平衡; 吸附动力学

Adsorption equilibrium and kinetics of SO₂ on activated carbon

Abstract:

The adsorption equilibrium and kinetics of the flue gas SO₂ removal on activated carbon were investigated based on a fixed bed reactor. The results show that there is a rapid SO₂ adsorption rate on activated carbon in the initial stage, which is determined by the surface adsorption, after that the adsorption rate drops sharply due to the effect of intraparticle diffusion, and then the adsorption rate drops slowly and the amount of SO₂ adsorbed increases slowly until the adsorption equilibrium, which is determined by the desorption rate of H₂SO₄. The SO₂ adsorption rate and the amount of SO₂ adsorbed increases with decreasing the particle size of activated carbon and increasing SO₂ inlet concentration. The Bangham kinetic model can be used to predict the kinetics of SO₂ adsorption on activated carbon of different particle size under different SO₂ inlet concentration. Compared with Langmuir adsorption isotherm model, Freundlich adsorption isotherm model presents better fitted results for SO₂ adsorption equilibrium on activated carbon of different particle size.

Keywords: SO₂; activated carbon; adsorption equilibrium; adsorption kinetics

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