

工程热物理

氨水细喷雾吸收CO₂的体积总传质系数

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摘要:

二氧化碳减排已经成为国际关注的焦点问题,近年来,二氧化碳捕集与封存技术(capture and storage of CO₂, CCS)被认为是减少CO₂排放的有效途径。氨水作为一种新的吸收剂得到普遍关注。为了为进一步的工业设计提供参考依据,该文采用喷雾塔对氨水细喷雾吸收CO₂进行试验研究,考察氨水流量和氨水浓度对CO₂脱除率的影响,测定了氨水细喷雾吸收CO₂的体积总传质系数,研究氨水浓度、氨水流量、进口气体流量、CO₂进口浓度和温度对体积总传质系数的影响。实验结果表明,体积总传质系数随着气体流量、氨水流量、氨水浓度的升高而增大,随着CO₂进口浓度升高略微下降;当温度低于40℃,体积总传质系数随反应温度升高而增加,至40℃达到最大值。研究发现氨水浓度是影响体积总传质系数的关键因素。

关键词: 二氧化碳 氨水 喷雾 体积总传质系数

Volumetric Overall Mass Transfer Coefficients of CO₂ Absorption Into Aqueous Ammonia of Fine Spray

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Abstract:

Carbon dioxide emissions has become the focus of world attention. In recent years, capture and storage of CO₂ (CCS) is considered to be a potential technical on reducing CO₂ emissions. As a kind of new absorbent, the ammonia solution obtains universal attention. In order to provide reference data to the future industrial design, the absorption of CO₂ into aqueous ammonia had been studied in a spray tower at atmospheric pressure. The results show that the higher concentration and flow rate of the aqueous ammonia solution are beneficial to promote CO₂ removal efficiency. The volumetric overall mass transfer coefficients of CO₂ absorption into aqueous ammonia were measured. It was found that the performance of the spray column varies with the tested process parameters, including ammonia concentration, liquid flow rate, gas flow rate, CO₂ concentration in inlet gas and temperature. Experimental results show that the volumetric overall mass transfer coefficients decreases slightly when increasing CO₂ inlet concentration. The volumetric overall mass transfer coefficients increases remarkably with the ammonia concentration and also increases with the gas flow rate and liquid flow rate. It was also found that the temperature affects the volumetric overall mass transfer coefficients. When the temperature in the spray tower is lower than 40℃, the volumetric overall mass transfer coefficients increases with the temperature. Whereas, when the temperature in the spray tower is higher than 40℃, the volumetric overall mass transfer coefficients decreases with the increasing temperature.

Keywords: carbon dioxide ammonia spray volumetric overall mass transfer coefficient

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