

论文

真空变压吸附提浓煤矿乏风瓦斯的抽真空排放过程

张传钊, 刘应书, 李永玲, 杨雄, 孟宇

北京科技大学 机械工程学院, 北京 100083

摘要:

研究了活性炭的平衡吸附性能, 计算出该种活性炭对甲烷和氮气的混合气体的分离因子为5.20, 并采用以该种活性炭为吸附剂的三塔真空变压吸附装置, 研究了循环流程中的抽排步骤对吸附分离效果的影响, 并分析了影响抽排过程的因素。结果表明: 引入抽排步骤可以在不改变吸附与解吸压力的情况下有效提高产品气中甲烷浓度。而甲烷浓度会随抽排比的增加而增加, 但存在一个极限值, 达到极限值之后趋于稳定。与此同时, 回收率随抽排比的增加而不断下降。并且均压过程与吸附压力会影响抽排过程。与抽排气排空流程相比, 采用抽排气回流流程可以有效地提高产品气甲烷回收率, 但并不一定提高产品气甲烷浓度, 存在一个临界抽排比, 小于此值时, 采用抽排气回流流程反而会降低产品气甲烷浓度。在吸附与解吸压力分别为140 kPa与14 kPa时, 采用该流程可将0.2%的原料气提升至0.680%。

关键词: 真空变压吸附 (VPSA); 煤矿乏风瓦斯 (VAM); 活性炭; 提浓

Vacuum exhaust process in vacuum pressure-swing adsorption for upgrading ventilation air methane

Abstract:

The equilibrium adsorption characteristics of activated carbon were tested and researched. Equilibrium selectivity of the activated carbon was 5.20. Vacuum exhaust process in three-bed vacuum pressure swing adsorption (VPSA) for concentrating ventilation air methane (VAM) was studied experimentally. The effect of vacuum exhaust ratio on methane concentration and recovery were investigated. The factors which effect on vacuum exhaust process were analyzed. The results show that vacuum exhaust step can increase the methane concentration of product gas without increasing pressure. As the ratio increases, the concentrations of methane in both product and effluent first increase, and then reach steady state after a certain vacuum exhaust ratio. At the same time, methane recovery is decreased. The pressure equalizing processes and adsorption pressure have obvious effect on the vacuum exhaust process. The process of vacuum exhaust gas recovered can increase methane recovery, but not always increase the methane content of the product gas, there is a critical vacuum exhaust ratio, it will decrease the methane concentration of product when the vacuum exhaust ratio is lower than this value. This process of vacuum exhaust gas recovered can enrich the methane concentration from 0.2% to 0.680% with the adsorption and desorption pressure of 140 kPa and 14 kPa. The results could provide reference for the industrial application in VAM enrichment.

Keywords: vacuum pressure swing adsorption (VPSA); ventilation air methane (VAM); activated carbon; upgrading

收稿日期 2012-03-02 修回日期 2012-08-13 网络版发布日期 2013-03-05

DOI:

基金项目:

国家高技术发展计划(863)资助项目(2009AA063201)

通讯作者: 张传钊

作者简介: 张传钊 (1987—), 男, 辽宁大连人, 博士研究生

作者Email: chuanzhao.zhang@163.com.cn

参考文献:

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF (1237KB)
- ▶ [HTML全文]
- ▶ 参考文献PDF
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 真空变压吸附 (VPSA); 煤矿乏风瓦斯 (VAM); 活性炭; 提浓

本文作者相关文章

- ▶ 张传钊
- ▶ 李永玲
- ▶ 刘应书
- ▶ 杨雄
- ▶ 孟宇

PubMed

- ▶ Article by Zhang, Z.Z
- ▶ Article by Li, Y.L
- ▶ Article by Liu, Y.S
- ▶ Article by Yang, X
- ▶ Article by Meng, Y

