

燃烧中吸附剂捕集铅的实验研究

张小锋¹;姚强¹;宋蔷¹;李水清¹

清华大学热科学与动力工程教育部重点实验室¹

收稿日期 2007-2-13 修回日期 网络版发布日期 2008-3-15 接受日期

摘要

使用一维炉实验台对氧化铝、氢氧化钙和高岭土三种吸附剂对铅的捕集进行了实验研究。铅以醋酸铅溶液的形式通过空气雾化引入到液化石油气燃烧区, 吸附剂由压缩空气携带从1473K喷入炉内。按照美国EPA标准方法使用Andersen撞击器对颗粒物进行等动量采样, 采用电感耦合等离子体发射光谱仪(ICP-AES)测量样品中铅的含量。研究表明: 亚微米范围的铅未被吸附剂所捕集, 仍以PbO或PbCl₂颗粒存在, 微米范围的铅是被吸附剂捕集形成。高岭土对铅的捕集明显好于氧化铝和氢氧化钙, 这是由于高岭土产生的活性位Al₂O₃·2Si₂O与PbO蒸气分子间有较强的化学吸附反应。高岭土给料量为10g/h时大部分铅分布在亚微米范围, 给料量为20g/h时铅呈双峰分布, 给料量为60g/h时大部分铅被捕集转移到微米范围。氯元素对高岭土捕集铅有很强的抑制作用, 这种抑制很可能是因为活性位Al₂O₃·2Si₂O与PbCl₂的反应性要大大低于Al₂O₃·2Si₂O与PbO的反应性。

关键词 [铅](#); [吸附剂](#); [捕集](#); [颗粒物](#); [粒径分布](#)

分类号 [TK 16](#); [X 513](#)

Experimental Study on Lead Capture by Sorbents During Combustion

Abstract

Lead capture by three sorbents: alumina, calcium hydroxide and kaolinite, were investigated experimentally using a laboratory one-dimension furnace. Aqueous solution of lead acetate was introduced into furnace through a liquefied petroleum gas flame via air atomization. Sorbents were introduced into furnace by compressed air at 1473K. Isokinetic sampling was done using Thermo Andersen impactor according to standard method of U.S. EPA. Lead content in samples was measured by inductively coupled plasma atomic emission spectrometry (ICP-AES). The results show that: Lead in submicron size range was not captured by sorbents and still existed in the form of PbO or PbCl₂ particles, lead in micron size range was formed by sorbents adsorption. Effect of lead capture by kaolinite was much better than by alumina and calcium hydroxide, the reason was the higher chemical adsorption reaction between active sites Al₂O₃·2Si₂O and molecules of PbO vapor. Majority of lead remained in submicron size range when kaolinite feed rate was 10g/h, lead presented a bimodal particle size distribution when kaolinite feed rate was 20g/h, and majority of lead was captured and transferred to micron size range when kaolinite feed rate was 60g/h. Chlorine has highly inhibition effect to lead capture by kaolinite, the possible reason was that the reaction between active sites Al₂O₃·2Si₂O and PbCl₂ was much less active than reaction between active sites Al₂O₃·2Si₂O and PbO.

Key words [Lead](#) [Sorbents](#) [Capture](#) [Particulate matters](#) [Particle size distribution](#)

DOI:

通讯作者 张小锋 zhangxf02@mails.tsinghua.edu.cn

作者个人主页 张小锋 姚强 宋蔷 李水清

扩展功能

本文信息

▶ [Supporting info](#)

▶ [PDF \(285KB\)](#)

▶ [\[HTML全文\]\(OKB\)](#)

▶ [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](#)

▶ [复制索引](#)

▶ [Email Alert](#)

相关信息

▶ [本刊中 包含“铅; 吸附剂; 捕集; 颗粒物; 粒径分布” 的相关文章](#)

▶ 本文作者相关文章

· [张小锋](#)

· [姚强](#)

· [宋蔷](#)

· [李水清](#)