

全温度段裂解提质对锡盟褐煤成浆特性的影响

李燕, 王智化, 梁晓晔, 黄镇宇, 刘建忠, 周俊虎, 岑可法

浙江大学 能源清洁利用国家重点实验室 热能工程研究所, 浙江 杭州 310027

Influence of pyrolysis temperature on slurry characteristics of Ximeng lignite char

LI Yan, WANG Zhi-hua, LIANG Xiao-ye, HUANG Zhen-yu, LIU Jian-zhong, ZHOU Jun-hu, CEN Ke-fa

State Key Laboratory of Clean Energy Utilization, Institute for Thermal Power Engineering, Zhejiang University, Hangzhou 310027, China

- [摘要](#)
- [参考文献](#)
- [相关文章](#)
- [点击分布统计](#)
- [下载分布统计](#)

 全文: [PDF \(1474 KB\)](#) | [HTML \(1 KB\)](#) 输出: [BibTeX](#) | [EndNote \(RIS\)](#) | [背景资料](#)

摘要 通过对锡盟褐煤进行涵盖高、中、低完整温度段的裂解提质,研究了裂解过程对煤质特性、成浆浓度、浆体流变特性以及稳定性的影响。对锡盟褐煤在隔绝空气条件下裂解,测量不同浓度浆体的黏度,并对剪切速率和表观黏度进行拟合得到不同浆体不同浓度的流变特性曲线,根据国标规定方法测量浆体的实际浓度以及浆体稳定性。并从裂解过程中样品表面官能团和孔隙结构变化角度分析裂解对锡盟原煤及半焦成浆特性的作用机理。实验结果表明,裂解过程可以减少样品中的含氧官能团,降低其亲水性,有利于成浆浓度的提高,成浆浓度随裂解温度的升高呈现先增大后减小的变化趋势,但是裂解对浆体的稳定性有负面影响。随裂解温度的提高,含氧官能团的分解导致半焦的孔隙结构发生显著变化,平均孔径先减小后增大,比表面积和孔容积呈先增大后减小趋势。

关键词: 裂解 水煤浆 半焦 成浆特性 官能团 孔隙结构

Abstract: Ximeng lignite was pyrolyzed at different temperatures and different characteristics including coal property, slurry ability, rheological behavior and stability of coal water slurry made from char were investigated. Pyrolysis was conducted in absence of air. Viscosities of different density slurries were measured and the curves of rheological behavior were fit through shearing rate and apparent viscosity. Actual slurry density and stability was measured according to national standard method. The mechanism of pyrolysis for raw coal and char slurry was analyzed through the alteration of surface functional groups and pore structure. The results show that pyrolysis could reduce oxygen-containing functional groups in samples and bring down their hydrophilicity, which is benefit to the improvement of slurry density. Water slurry density shows first an increase, and then decrease with the rise of temperature. Pyrolysis seems to be unfavorable to the stability of slurry. Pore structure is changed a lot through pyrolysis due to the decomposition of oxygen-containing groups. Specific surface area and pore volume first increase, and then decrease, but average pore diameter shows a totally opposite trend.

Key words: pyrolysis coal water slurry char slurry property functional groups pore structure

收稿日期: 2013-05-25;

基金资助:

国家重点基础研究发展规划(973计划, 2012CB214906)。

通讯作者: 王智化(1977-),男,教授,主要从事煤粉高效低污染燃烧、多种污染物一体化协同脱除等, E-mail:

wangzh@zju.edu.cn E-mail: wangzh@zju.edu.cn

引用本文:






李燕,王智化,梁晓晔等. 全温度段裂解提质对锡盟褐煤成浆特性的影响[J]. 燃料化学学报, 2014, 42(02): 150-157.

服务

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [E-mail Alert](#)
- ▶ [RSS](#)

作者相关文章

- ▶ [李燕](#)
- ▶ [王智化](#)
- ▶ [梁晓晔](#)
- ▶ [黄镇宇](#)
- ▶ [刘建忠](#)
- ▶ [周俊虎](#)
- ▶ [岑可法](#)

- [1] 阎军, 鞠文斐, 于秀菊. 滚筒式褐煤干燥提质技术及经济性分析[J]. 煤炭工程, 2012, (12): 64-65. (YAN Jun, JU Wen-fei, YU Xiu-ju. Analysis on drum type upgrading technology and economy of lignite[J]. Coal Engineering, 2012, (12): 64-65.)
- [2] GUAN J, HE D M, SONG B B, ZHANG Q M. Lignite thermal upgrading and its effect on surface properties[J]. Nat Res Sustain Develop, 2012, 524-527: 887-893.
- [3] OSMAN H, JANGAM S V, LEASE J D, MUJUMDAR A S. Drying of low-rank coal (LRC)-A review of recent patents and innovations[J]. Drying Technol, 2011, 29(15): 1763-1783. 
- [4] 崔晓曦, 李忠, 左永飞. 以褐煤干馏提质为基础的多联产技术分析[J]. 煤化工, 2012, 40(5): 30-37. (CUI Xiao-xi, LI Zhong, ZUO Yong-fei. Development prospect of polygeneration technology based on lignite upgrading through pyrolysis[J]. Coal Chemical Industry, 2012, 40(5): 30-37.)
- [5] 王勤辉, 骆仲洪, 方梦祥, 倪明江, 岑可法. 12兆瓦热电气多联产装置的开发[J]. 燃料化学学报, 2002, 30(2): 141-146. (WANG Qin-hui, LUO Zhong-yang, FANG Meng-xiang, NI Ming-jiang, CEN Ke-fa. Development of a 12MW multi-generation of gas, steam and power[J]. Journal of Fuel Chemistry and Technology, 2002, 30(2): 141-146.)
- [6] 关珺, 何德民, 张秋民. 褐煤热解提质技术与多联产构想[J]. 煤化工, 2011, 39(6): 1-9. (GUAN Jun, HE De-min, ZHANG Qiu-min. The technology of improving lignite quality through pyrolysis and the concept of poly-generation[J]. Coal Chemical Industry, 2011, 39(6): 1-9.)
- [7] 张培丽. 褐煤半焦制备水煤浆的研究[D]. 大连: 大连理工大学, 2010. (ZHANG Pei-li. Preparation of char water slurry from lignit char[D]. Da Lian: Da Lian University of Technology, 2010.)
- [8] YI L F, HAO Q H, LI J J, SHENG W Z, QIU M Z. Static stability and rheological behavior of lignite char-water mixture[J]. Fuel, 2010, 104: 7-13.
- [9] 刘明强, 刘建忠, 王瑞坤, 周俊虎, 岑可法. 热解温度对褐煤半焦成浆特性影响的实验研究[J]. 中国电机工程学报, 2013, 33(8): 36-43. (LIU Ming-qiang, LIU Jian-zhong, WANG Rui-kun, ZHOU Jun-hu, CEN Ke-fa. Effects of pyrolysis temperature on slurry ability of lignite semi-coke[J]. Proceedings of the CSEE, 2013, 33(8): 36-43.)
- [10] 李庆钊, 林柏泉, 赵长遂, 武卫芳. 基于傅里叶红外光谱的高温煤焦表面化学结构特性分析[J]. 中国电机工程学报, 2011, 31(32): 46-52. (LI Qing-zhao, LIN Bai-quan, ZHAO Chang-sui, WU Wei-fang. Chemical structure analysis of coal char surface based on fourier-transform infrared spectrometer[J]. Proceedings of the CSEE, 2011, 31(32): 46-52.)
- [11] JONES J M, POURKASHANIAN M, RENA C D, WILLIAMS A. Modelling the relationship of coal structure to char porosity[J]. Fuel, 1999, 78(14): 1737-1744. 
- [12] ROH N S, SHIN D H, KIM D C, KIM J D. Rheological behavior of coal water mixture. 2. Effect of surfactants and temperature[J]. Fuel, 1995, 74(9): 1313-1318. 
- [13] 张国枢, 谢应明, 顾建明. 煤炭自燃微观结构变化的红外光谱分析[J]. 煤炭学报, 2003, 28(5): 473-476. (ZHANG Guo-shu, XIE Ying-ming, GU Jian-ming. Infrared spectral analysis of microstructure change during the coal spontaneous oxidation[J]. Journal of China Coal Society, 2003, 28(5): 473-476.)
- [14] SOLOMON P R, CARANGELO R M. FTIR analysis of coal. 2. Aliphatic and aromatic hydrogen concentration[J]. Fuel, 1988, 67(2): 949-959. 
- [15] 孙成功, 李保庆, 尉迟唯. 煤的孔隙结构特征对水煤浆性质的影响[J]. 燃料化学学报, 1996, 24(5): 434-439. (SUN Cheng-gong, LI Bao-qing, YU Chi-wei. Characterization of pore size distribution and slurry ability of coal[J]. Journal of Fuel Chemistry and Technology, 1996, 24(5): 434-439.) 
- [16] 虞育杰, 刘建忠, 张传名, 赵卫东, 周俊虎, 岑可法. 低挥发分煤的成浆特性和水煤浆流变特性[J]. 浙江大学学报(工学版), 2011, 45(2): 335-340. (YU Yu-jie, LIU Jian-zhong, ZHANG Chuan-ming, ZHAO Wei-dong, ZHOU Jun-hu, CEN Ke-fa. Slurrying characteristic of low-volatile coal and the rheological characteristics of coal water slurry[J]. Journal of Zhejiang University (Engineering Science), 2011, 45(2): 335-340.)
- [17] 郝爱民, 李新生, 宋永玮. 煤的改性提质对水煤浆成浆性的影响[J]. 煤炭转化, 2001, 24(3): 47-50. (HAO Ai-min, LI Xin-sheng, SONG Yong-wei. Effect on slurry ability of CWS about modified coal[J]. Coal Conversion, 2011, 24(3): 47-50.)
- [18] 王睿坤, 刘建忠, 胡亚轩, 高夫燕, 周俊虎, 岑可法. 水煤浆掺混湿污泥对浆体成浆特性的影响[J]. 煤炭学报, 2010, 35(S0): 199-204. (WANG Rui-kun, LIU Jian-zhong, HU Ya-xuan, GAO Fu-yan, ZHOU Jun-hu, CEN Ka-fa. Influence of wet sludge on the slurrying properties of coal-water slurries[J]. Journal of China Coal Society, 2010, 35(S0): 199-204.)
- [19] 代淑兰, 陈良勇, 代少辉. 水煤浆的流变特性研究进展[J]. 锅炉技术, 2010, 41(3): 76-80. (DAI Shu-lan, CHEN Liang-yong, DAI Shao-hui. Advances in reseach on rheological behaviour of coal-water slurries[J]. Boiler Technology, 2010, 41(3): 76-80.)
- [1] 韩峰, 张衍国, 蒙爱红, 李清海. 水城褐煤热解的气体产物析出特征及甲烷的生成反应类型研究[J]. 燃料化学学报, 2014, 42(01): 7-12.
- [2] 景旭亮, 王志青, 张乾, 房倚天. 流化床气化炉半焦细粉的燃烧特性及其动力学研究[J]. 燃料化学学报, 2014, 42(01): 13-21.
- [3] 钟梅, 马风云. 不同气氛下煤连续热解产物的分配规律及产品品质分析[J]. 燃料化学学报, 2013, 41(12): 1427-1436.
- [4] 黄鑫, 张书, 林雄超, 王永刚, 徐敏. 低温加压热解脱氧对胜利褐煤亲水性的影响[J]. 燃料化学学报, 2013, 41(12): 1409-1414.
- [5] 王永刚, 周剑林, 陈艳巨, 胡秀秀, 张书, 林雄超. ^{13}C 固体核磁共振分析煤中含氧官能团的研究[J]. 燃料化学学报, 2013, 41(12): 1422-1426.

- [6] 章国栋, 于凤文, 高龙超, 王玮瑾, 卢美贞, 计建炳. 熔盐热裂解大豆油的特性研究[J]. 燃料化学学报, 2013, 41(11): 1316-1321.
- [7] 张萍, 李露, 于凤丽, 解从霞, 于世涛, 刘仕伟, 刘福胜. $\text{SO}_4^{2-}/\text{ZrO}_2$ 的制备工艺对催化橡胶籽油裂解油酯化的影响[J]. 燃料化学学报, 2013, 41(11): 1322-1327.
- [8] 刘殊远, 汪印, 武荣成, 曾玺, 许光文. 热态半焦和冷态半焦催化裂解煤焦油研究[J]. 燃料化学学报, 2013, 41(09): 1041-1049.
- [9] 李国娜, 李春迎, 王渭娜, 沈文, 吕剑, 王文亮. 吸热型碳氢燃料正癸烷热裂解机理、热沉及产物分布的理论研究[J]. 燃料化学学报, 2013, 41(09): 1136-1145.
- [10] 陈宗定, 公旭中, 王志, 王永刚, 张书, 许德平. KNO_3 体系中离子液体辅助水煤浆电解脱硫[J]. 燃料化学学报, 2013, 41(08): 928-936.
- [11] 李凯, 郑燕, 龙潭, 朱锡锋. 利用Py-GC/MS研究温度和时间对生物质热解的影响[J]. 燃料化学学报, 2013, 41(07): 845-849.
- [12] 费雯婷, 刘荣厚, 周维奇, 尹仁湛. 添加乙酸乙酯对生物油稳定性的影响[J]. 燃料化学学报, 2013, 41(06): 667-672.
- [13] 高松平, 赵建涛, 王志青, 王建飞, 房倚天, 黄戒介. CO对褐煤快速热解行为的影响[J]. 燃料化学学报, 2013, 41(05): 550-557.
- [14] 仲卫成, 郭庆杰, 王许云, 张亮. 小球藻热裂解油催化加氢精制研究[J]. 燃料化学学报, 2013, 41(05): 571-578.
- [15] 杨永良, 李增华, 季淮君, 彭英健, 刘震. 煤中可溶有机质对煤的孔隙结构及甲烷吸附特性影响[J]. 燃料化学学报, 2013, 41(04): 385-390.

版权所有 © 《燃料化学学报》编辑部

本系统由北京玛格泰克科技发展有限公司设计开发 技术支持: support@magtech.com.cn