

### 流化床热解煤焦油的降黏研究

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### Viscosity reduction of coal tar from fluidized bed pyrolysis

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**摘要** 对循环流化床热解煤焦油多联产热解所得煤焦油流动性差的问题采取了一系列的降黏研究。通过X射线衍射测试可以排除室温下蜡结晶影响煤焦油黏度的可能,对比了煤焦油和煤沥青的黏度和族组分差异,考察了喹啉不溶物对软化点的影响,结果表明,采取馏分油降黏是合理的。分别添加四种馏分油对煤焦油进行了降黏实验,通过色谱质谱联机分析馏分油的成分,认为既含亲水基又含憎水基的分子具有很好的降黏效果,而且含量越多降黏效果越好。通过添加四种单组分化合物的降黏实验和分析,进一步验证了所得到的降黏理论,而且可以判断同时含有亲水基和憎水基的分子降黏效果优于只含憎水基不含亲水基的分子。

**关键词:** 煤焦油 降黏 馏分油 亲水基 憎水基

**Abstract:** For the poor fluidity of coal tar generated from circulating fluidized bed polygeneration system, a series of research was carried out to decrease the viscosity. Through the analysis of X-ray diffraction, the possibility that the wax crystal increases the viscosity at room temperature was excluded. The viscosity and contents between coal tar and coal tar pitch were compared, and the impact of quinoline insoluble on the softening point was also investigated. The results reveal that it is reasonable to employ the distillates to decrease the viscosity of coal tar. Four kinds of distillates were blended in the coal tar to improve the fluidity, and the composition of the distillates was gotten through the GC-MS analysis. It is concluded that the molecule which contains both hydrophilic groups and hydrophobic groups possesses a great effect on the viscosity reduction, and the more the amount, the better the viscosity reduction. Four kinds of mono-component additives were tested, and the theory was verified. For the viscosity reduction, the molecule with both groups is better than that with only hydrophobic groups.

**Key words:** coal tar viscosity reduction fractions hydrophilic groups hydrophobic groups

收稿日期: 2012-06-11;

基金资助:

国家高技术研究发展计划(863计划, 2007AA05Z334); 浙江省自然科学基金(R1080101); 国际合作项目(2011DFR60190)。

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引用本文:

余盼龙,方梦祥,唐巍等. 流化床热解煤焦油的降黏研究[J]. 燃料化学学报, 2013, 41(01): 26-32.

YU Pan-long,FANG Meng-xiang,TANG Wei et al. Viscosity reduction of coal tar from fluidized bed pyrolysis[J]. J Fuel Chem Technol, 2013, 41(01): 26-32.

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- [1] 方梦祥, 岑建孟, 石振晶, 王勤辉, 骆仲决. 75t/h循环流化床多联产装置试验研究[J]. 中国电机工程学报, 2010, 30(29): 9-15. (FANG Meng-xiang, CEN Jian-meng, SHI Zhen-jing, WANG Qin-hui, LUO Zhong-yang. Experimental study on 75t/h circulating fluidized bed poly-generation system[J]. Proceedings of the CSEE, 2010, 30(29): 9-15.)
- [2] 周凤山, 吴瑾光. 稠油化学降黏技术研究进展[J]. 油田化学, 2001, 18(3): 133-134. (ZHOU Feng-shan, WU Jin-guang. Advances in chemical viscosity-reducing methods and techniques for viscous crude oils[J]. Oilfield Chemistry, 2001, 18(3): 133-134)
- [3] 周春光, 王树荣, 方梦祥, 石振晶, 王勤辉, 骆仲决. 低温煤焦油流动性改善的实验研究[J]. 中国电机工程学报, 2009, 29(S1): s145-s149. (ZHOU Chun-guang, WANG Shu-rong, FANG Mengxiang, SHI Zhenjing, WANG Qin-hui, LUO Zhongyang. Experimental Research on the fluidity of low-temperature coal tar[J]. Proceedings of the CSEE, 2009, 29(S1): s145-s149.)
- [4] POPPLETON B J, TRIFFETT A C K. Viscosity modification of flash pyrolysis tars[J]. Fuel, 1983, 62(12): 1514-1515. 
- [5] 许斌, 欧阳春发, 胡光洲, 古力虎. 中温沥青和改质沥青流变性能研究[J]. 炭素, 2002, (4): 3-7. (XU Bin, OUYANG Chun-fa, HU Guang-zhou, GU Li-hu. Study on the rheological behavior of the medium pitches and modified pitches[J]. Carbon(China), 2002, (4): 3-7.)
- [6] 许斌, 欧阳春发, 古力虎, 胡光洲. 油酸改性沥青流变性能的研究[J]. 武汉科技大学学报: 自然科学版, 2002, 25(4): 345-348. (XU Bin, OUYANG Chun-fa, GU Li-hu, HU Guang-zhou. Rheological behavior of the oleic acid modified pitches[J]. Journal of Wuhan University of Science and Technology, 2002, 25(4): 345-348.)
- [7] 许斌, 欧阳春发, 李铁虎. 硬脂酸改性沥青流变性能的研究[J]. 煤炭转化, 2002, 25(2): 82-86. (XU Bin, OUYANG Chun-fa, LI Tie-hu. Study on the rheological behavior of the stearic acid modified pitches[J]. Coal Conversion, 2002, 25(2): 82-86.)
- [8] 杨琴, 李铁虎, 林起浪, 单玲. 呋喃树脂对煤沥青流变性能的影响[J]. 新型炭材料, 2005, 20(1): 81-82. (YANG Qin, LI Tie-hu, LIN Qi-lang, SHAN Ling. The effect of furan resin on the rheological properties of coal tar pitch[J]. New Carbon Materials, 2005, 20(1): 81-82.)
- [9] 古力虎. 煤沥青的流变性能及其改性研究[D]. 武汉科技大学, 2004. (GU Li-hu. Study on the rheological laws and the modification rules of the coal tar pitches[D]. Wuhan: Wuhan University of Science and Technology, 2004.)
- [10] 李鸿英, 张劲军, 高鹏. 蜡晶形态、结构与含蜡原油流变性的关系[J]. 油气储运, 2004, 23(9): 19-23. (LI Hong-ying, ZHANG Jin-jun, GAO Peng. Correlation between wax crystal morphology and crude rheology[J]. Oil & Gas Storage and Transportation, 2004, 23(9): 19-23.)
- [11] 敬加强, 罗平亚, 朱毅飞. 原油组成对其黏度影响的灰色关联分析[J]. 油气田地面工程, 2000, 19(6): 11-13. (JING Jia-qiang, LUO Ping-ya, ZHU Yi-fei. Crude composition influencing its viscosity and its gray correlation analysis[J]. Oil-Gasfield Surface Engineering, 2000, 19(6): 11-13.)
- [12] 刘海波, 郭绪强. 原油组分的性质与结构对其黏度的影响[J]. 新疆石油地质, 2008, 29(3): 347-349. (LIU Hai-bo, GUO Xu-qiang. Influence of property and structure of crude oil on its viscosity[J]. Xinjiang Petroleum Geology, 2008, 29(3): 347-349.)
- [13] 蒋庆哲, 宋昭峥, 葛际江, 赵福麟. 降凝剂对蜡晶晶格参数的影响[J]. 中国石油大学学报: 自然科学版, 2006, 30(1): 118-122. (JIANG Qing-zhe, SONG Zhao-zheng, GE Ji-jiang, ZHAO Fulin. Effects of pour point depressants on crystal lattice parameters of waxes[J]. Journal of China University of Petroleum: Nature Science Edition, 2006, 30(1): 118-122.)
- [14] 邢义良, 郎兆新, 张丽华. 稠油流变性的测量和研究[J]. 西安石油学院学报, 1998, 13(2): 25-27. (XING Yi-liang, LANG Zhao-xin, ZHANG Li-hua. The study and the measurement of rheology of viscous crude oil[J]. Journal of Xi'an Petroleum Institute, 1998, 13(2): 25-27.)
- [15] 张凯, 李阳, 王琳娜, 王亚洲. 稠油流变特性实验研究[J]. 油气地质与采收率, 2007, 15(5): 91-94. (ZHANG Kai, LI Yang, WANG Lin-na, WANG Ya-zhou. Experimental study on rheological characteristics of heavy oil[J]. Petroleum Geology And Recovery Efficiency, 2007, 15(5): 91-94.)
- [16] ALCAIZ-MONGE J, CAZORLA-AMORÓS D, LINARES-SOLANO A. Characterisation of coal tar pitches by thermal analysis, infrared spectroscopy and solvent fractionation[J]. Fuel, 2001, 80(1): 41-48. 
- [17] 水恒福, 张德祥, 张超群. 煤焦油分离与精制[M]. 北京: 化学工业出版社, 2007: 25. (SHUI Heng-fu, ZHANG De-xiang, ZHANG Chao-qun. Separation and refining of coal tar[M]. Beijing: Chemical Industry Press, 2007: 25.)
- [18] PANAITESCU C, PREDEANU G. Microstructural characteristics of toluene and quinoline insolubles from coal-tar pitch and their cokes[J]. Int J Coal Geol, 2007, 71(4): 448-454. 
- [19] 李香兰, 梁晓峰, 阎效德, 李凡, 谢克昌. 用GC-MS对平朔煤IHR低温热解煤焦油组成的分析[J]. 煤炭转化, 1998, 21(2): 75-81. (LI Xiang-lan, LIANG Xiao-yi, YAN Xiao-de, LI Fan, XIE Ke-chang. GC-MS analyzing of Pingshuo coal tar from IHR low temperature pyrolysis[J]. Coal Conversion, 1998, 21(2): 75-81.)
- [20] WANG P, JIN L, LIU J, ZHOU S, HU H. Analysis of coal tar derived from pyrolysis at different atmospheres[J]. Fuel, in Press, Corrected Proof, Available online 30 June 2010.
- [21] 李秀君, 拾方治. 粘流态沥青粘度分析[J]. 石油沥青, 2003, 17(2): 28-30. (LI Xiu-jun, SHI Fang-zhi. Study on viscosity of viscous flowing asphalt[J]. Petroleum Asphalt, 2003, 17(2): 28-30.)
- [1] 王永刚, 张海永, 张培忠, 许德平, 赵宽, 王芳杰. NiW/γ-Al<sub>2</sub>O<sub>3</sub> 催化剂的低温煤焦油加氢性能研究[J]. 燃料化学学报, 2012, 40(12): 1492-1497.
- [2] 许洪星, 蒲春生, 吴飞鹏. 基于油藏实际的稠油层内水热催化裂解机理研究[J]. 燃料化学学报, 2012, 40(10): 1206-1211.
- [3] 王齐, 王宗贤, 沐宝泉, 郭爱军, 郭凯黎. 委内瑞拉常压渣油供氢热转化研究[J]. 燃料化学学报, 2012, 40(10): 1200-1205.
- [4] 李芙蓉, 柳智, 宋新旺, 马宝东, 张文. 金属阳离子对聚丙烯酰胺溶液黏度的影响及其降黏机理研究[J]. 燃料化学学报, 2012, 40(01): 43-47.
- [5] 许洪星, 蒲春生. 超声辅助稠油层内催化水热裂解实验研究[J]. 燃料化学学报, 2011, 39(08): 606-610.
- [6] 吴川, 雷光伦, 姚传进, 盖平原, 曹嫣妮, 李啸南. 双亲催化剂作用超稠油水热裂解降黏机理研究[J]. 燃料化学学报, 2010, 38(06): 684-690.
- [7] 丁一慧, 陈航, 王东飞, 马伟光, 王金凤, 许德平, 王永刚. 高温煤焦油的超临界萃取分馏研究[J]. 燃料化学学报, 2010, 38(02): 140-143.
- [8] 樊泽霞, 王腾飞, 何玉海. 离子液体对稠油的改质降黏作用影响因素研究[J]. 燃料化学学报, 2009, 37(06): 690-693.

- [9] 程相林, 查庆芳, 钟景涛, 侯宝花, 郭燕生. 烷基在针状焦形成中的作用[J]. 燃料化学学报, 2009, 37(02): 166-169.
- [10] 王勇, 云志. 金属间化合物SbSn的化学合成及其对原油乳液的降黏研究[J]. 燃料化学学报, 2008, 36(06): 701-705.
- [11] 柴永明, 相春娥, 孔会清, 柳云骐, 刘晨光. 馏分油浆态床加氢处理研究 I 催化剂制备方法[J]. 燃料化学学报, 2008, 36(06): 720-725.
- [12] 韩丽娜, 张荣, 毕继诚. 煤焦油及其组分在超临界水中的反应特性研究[J]. 燃料化学学报, 2008, 36(06): 653-659.
- [13] 刘永建, 胡绍彬, 闻守斌, 赵法军. 油藏矿物和化学剂强化稠油水热裂解降黏研究[J]. 燃料化学学报, 2008, 36(03): 302-305.
- [14] 韩丽娜, 张荣, 毕继诚. 超临界水中煤焦油沥青轻质化的实验研究[J]. 燃料化学学报, 2008, 36(01): 1-5.
- [15] 李伟, 朱建华, 齐建华. 纳米Ni催化剂在超稠油水热裂解降黏中的应用研究[J]. 燃料化学学报, 2007, 35(02): 176-180.

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