

陶瓷膜分布器强化氧气氧化苯酚羟基化反应

陈日志*, 包耀辉, 邢卫红, 金万勤, 徐南平

南京工业大学材料化学国家重点实验室, 江苏南京210009

CHEN Rizhi *, BAO Yaohui, XING Weihong, JIN Wanqin, XU Nanping

State Key Laboratory of Materials-Oriented Chemical Engineering, Nanjing University of Technology, Nanjing 210009, Jiangsu, China

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摘要 采用浸渍法制备CuO/TiO₂催化剂, 利用X射线衍射、透射电镜、程序升温还原等技术对催化剂进行了表征, 结果表明, CuO以分散态和晶体两种形式存在, 且与载体有强的相互作用. 以陶瓷膜为分布器控制氧气的进料, 进行了CuO/TiO₂催化氧气氧化苯酚羟基化反应. 与直接通入氧气方式相比, 采用孔径为0.5μm的陶瓷膜控制进氧, 可使苯二酚收率提高13%, 这主要是由于采用陶瓷膜作为氧气进料分布器可以提供大量具有微小尺寸的氧气气泡, 提高体积溶氧系数, 增强气液传质效果. 在优化的反应条件下, 苯二酚收率达2.5%. 对使用后的陶瓷膜进行扫描电镜表征, 发现陶瓷膜具有良好的稳定性.

关键词: 苯酚 羟基化 氧气 陶瓷膜 膜分布器

Abstract: A CuO/TiO₂ catalyst was prepared by impregnation and characterized by X-ray diffraction, transmission electron microscopy, and temperature-programmed reduction. Two types of dispersed species formed on the TiO₂ surface, which were possibly isolated and polymeric CuO species. The CuO catalyst interacted strongly with the TiO₂ support. A porous ceramic membrane was used as a distributor to control the supply of oxygen in phenol hydroxylation over the CuO/TiO₂ catalyst. Compared to a direct feed of oxygen without a membrane, the yield of dihydroxybenzene (DHB) increased by 13% using a porous ceramic membrane with a pore size of 0.5 μm as an oxygen distributor. This is because the membrane distributor produced numerous small oxygen bubbles, increasing the volumetric oxygen transfer coefficient and gas-liquid mass transfer. Optimizing reaction conditions resulted in a yield of DHB of 2.5%. Scanning electron microscope observation of the used ceramic membrane showed that it possessed excellent thermal and chemical stability.

Keywords: Phenol, Hydroxylation, Oxygen, Ceramic membrane, Membrane distributor

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[1] Elvers B, Hawkins S, Schultz G. Ullmans encyclopedia of chemical technology. 5th Ed. New York: VCH Publishing, 1992. 342


[2] Rao P R H P, Ramaswamy A V. Appl Catal A, 1993, 93: 123 


[3] Lu C J, Chen R Z, Xing W H, Jin W Q, Xu N P. AIChE J, 2008, 54: 1842 

[4] Courteix A, Bergel A. Enzyme Microb Technol, 1995, 17: 1087 

[5] Coronas J, Menendez M, Santamaria J. Chem Eng Sci, 1994, 49: 2015 

[6] Jiang H, Meng L, Chen R Z, Jin W Q, Xing W H, Xu N P. Ind Eng Chem Res, 2011, 50: 10458 

[7] Hamdy M S, Mul G, Wei W, Anand R, Hanefeld U, Jansen J C, Moulijn J A. Catal Today, 2005, 110: 264 

[8] Wang L P, Kong A G, Chen B, Ding H M, Shan Y K, He M Y. J Mol Catal A, 2005, 230: 143 

[9] Tang H L, Ren Y, Yue B, Yan S R, He H Y. J Mol Catal A, 2006, 260: 121 

[10] Dong Y L, Niu X Y, Zhu Y J, Yuan F L, Fu H G. Catal Lett, 2011, 141: 242 


[11] Lasson P O, Andersson A, Wallenberg L R, Svensson B. J Catal, 1996, 163: 279 

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- [12] Puskeiler R, Weuster-Botz D. *J Biotechnol*, 2005, 120: 430
- [13] Battistel E, Tassinari R, Fornaroli M. *J Mol Catal A*, 2003, 202: 107 
- [14] Gao X H, Xu J. *Catal Lett*, 2006, 111: 203 
- [15] Masumoto Y, Hamada R, Yokota K, Nishiyama S, Tsuruya S. *J Mol Catal A*, 2002, 184: 215 
- [16] Kanzaki H, Kitamura T, Hamada R, Nishiyama S, Tsuruya S. *J Mol Catal A*, 2004, 208: 203 
- [17] Miyahara T, Kanzaki H, Hamada R, Kuroiwa S, Nishiyama S, Tsuruya S. *J Mol Catal A*, 2001, 176: 141 
- [18] Zhong R G, She Y B, Wang Y H, Jiao R, Lü J T, Zhen Y (钟儒刚, 余远斌, 王云海, 焦蓉, 吕江涛, 甄岩). CN 1556084. 2004
- [1] 徐丹, 贾丽华, 郭祥峰. Cu 掺杂对介孔 $\text{VO}_x\text{-TiO}_2$ 催化苯羟基化制苯酚的影响[J]. 催化学报, 2013,34(2): 341-350
- [2] 白玉婷, 朱学成, 张利雄, 徐南平. Ni/SiO₂ 和 SO₃H-C/SBA-15 复合催化剂上硝基苯加氢制对氨基苯酚[J]. 催化学报, 2013,34(1): 263-271
- [3] 马璇璇, 朱银华, 李力成, 王昌松, 陆小华, 杨祝红. 介孔 TiO₂ 晶须负载 Au 的热稳定性[J]. 催化学报, 2012,33(9): 1480-1485
- [4] 李碧静, 唐荣芝, 陈彤, 王公应. 乙酰丙酮氧钛催化苯酚和碳酸二甲酯的酯交换反应[J]. 催化学报, 2012,33(4): 601-604
- [5] 党高飞, 石艳, 付志峰, 杨万泰. 磁性 Fe₃O₄@PS@PAMAM-Ag 复合催化粒子的制备及其可再生催化性能[J]. 催化学报, 2012,33(4): 651-658
- [6] 张海艳, 曹春晖, 赵健, 林瑞, 马建新. 燃料电池Pt 基核壳结构电催化剂的最新研究进展[J]. 催化学报, 2012,33(2): 222-229
- [7] 周贤太, 纪红兵. 蒙脱土负载钴卟啉: 一种在催化醇类氧化制备羰基化合物中可循环使用的高效催化剂[J]. 催化学报, 2012,33(12): 1906-1912
- [8] 徐加泉, 刘慧慧, 杨瑞光, 李桂英, 胡常伟. 活性炭催化苯一步羟基化制备苯酚[J]. 催化学报, 2012,33(10): 1622-1630