催化学报 » 2012, Vol. 33 » Issue (10) :1689-1695 DOI: 10.3724/SP.J.1088.2012.20520

研究论文

氨基功能化介孔氧化硅纳米中空球负载乙酰丙酮氧钒催化苯甲硫醚选择性氧化反应

王鹏1,2, 白诗扬1,2, 李博1, 杨启华1,*

1中国科学院大连化学物理研究所催化基础国家重点实验室, 辽宁大连 116023; 2中国科学院研究生院, 北京 100049

WANG Peng1,2, BAI Shiyang1,2, LI Bo1, YANG Qihua1,*

1State Key Laboratory of Catalysis, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, Liaoning, China; 2Graduate Univ of Chinese Academy of Sciences, Beijing 100049, China

- 摘要
- 参考文献
- 相关文章

Download: PDF (530KB) HTML (1KB) Export: BibTeX or EndNote (RIS) Supporting Info

摘要 首次将乙酰丙酮氧钒固载在氨基功能化的介孔氧化硅纳米中空球以及 SBA-15 (直型孔道结构) 和 SBA-16 (笼型孔道结构) 上, 并应用于苯甲硫醚选择氧化反应. 结果表明, 在温和的反应条件下, 上述催化剂均可催化苯甲硫醚高选择性地转化为亚砜产物 (选择性最高大于 99.0%). 动力学对比实验表明, 相比于直型和笼型介孔氧化硅, 纳米中空球负载的催化剂具有更高的转化频率. 这是因为纳米空心球尺寸小, 更有利于催化活性中心的暴露以及反应物和产物在催化过程中的扩散. 催化剂可循环使用多次, 其活性和选择性基本保持不变.

关键词: 氨基功能化 介孔氧化硅 纳米中空球 乙酰丙酮氧钒 苯甲硫醚 选择性氧化

Abstract: Vanadyl acetylacetonate [$VO(acac)_2$] was immobilized on amino functionalized mesoporous silica hollow nanospheres, as well as on amino functionalized SBA-15 (2D hexagonal mesostructure) and SBA-16 (cage-like mesostructure). All the heterogeneous catalysts exhibited high selectivity for sulfoxide (over 99.0%) in the selective oxidation of thioanisole under mild reaction conditions. The vanadium nanospheres exhibited higher turnover frequency than the counterparts of SBA-15 and SBA-16, which is attributed to the fact that the small nanoparticles would facilitate the diffusion of the products and reactants, as well as the exposure of catalytic active sites. The catalysts could be reused several times with little loss of their activity and selectivity.

Keywords: amino functionalization, mesoporous silica, hollow nanosphere, vanadyl acetylacetonate, thioanisole, selective oxidation

收稿日期: 2012-05-11; 出版日期: 2012-08-15

引用本文:

王鹏, 白诗扬, 李博等 .氨基功能化介孔氧化硅纳米中空球负载乙酰丙酮氧钒催化苯甲硫醚选择性氧化反应[J] 催化学报, 2012,V33(10): 1689-1695

WANG Peng, BAI Shi-Yang, LI Bo etc .Immobilization of Vanadyl Acetylacetonate on Amino Functionalized Hollow Silica Nanospheres and Its Catalytic Performance for Selective Oxidation of Thioanisole[J] Chinese Journal of Catalysis, 2012,V33(10): 1689-1695

链接本文:

http://www.chxb.cn/CN/10.3724/SP.J.1088.2012.20520 或 http://www.chxb.cn/CN/Y2012/V33/I10/1689

Service
- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- Email Alert
- RSS

作者相关文章
- 王鹏
- 白诗扬
- 李博
- 杨启华

[1] Lou X W, Archer L A, Yang Z Ch. Adv Mater, 2008, 20: 3987

[2] An K, Hyeon T. Nano Today, 2009, 4: 359

[3] Kim S W, Kim M, Lee W Y, Hyeon T. J Am Chem Soc, 2002, 124: 7642

[4] Chen H M, Liu R Sh, Lo M Y, Chang S C, Tsai L D, Peng Y M, Lee J F. J Phys Chem C, 2008, 112: 7522

[5] Liu J, Yang Q H, Zhang L, Yang H Q, Gao J S, Li C. Chem Mater, 2008, 20: 4268

[6] Liu J, Fan F T, Feng Zh Ch, Zhang L, Bai Sh Y, Yang Q H, Li C. J Phys Chem C, 2008, 112: 16445

[7] Liu J, Bai Sh Y, Zhong H, Li C, Yang Q H. J Phys Chem C, 2010, 114: 953

[8] Gao J S, Liu J, Tang J T, Jiang D M, Li B, Yang Q H. Chem Eur J, 2010, 16: 7852

[9] Tang J T, Liu J, Wang P Y, Zhong H, Yang Q H. Microporous Mesoporous Mater, 2010, 127: 119

[10] Gao J S, Liu J, Bai Sh Y, Wang P Y, Zhong H, Yang Q H, Li C. J Mater Chem, 2009, 19: 8580

[11] Bai Sh Y, Liu J, Gao J S, Yang Q H, Li C. Microporous Mesoporous Mater, 2012, 151: 474

[12] Fernandez I, Khiar N. Chem Rev, 2003, 103: 3651

[13] Kaczorowska K, Kolarska Z, Mitka K, Kowalski P. Tetrahedron, 2005, 61: 8315

[14] Jain S L, Sain B. Adv Syn Catal, 2008, 350: 1479

[15] Kowalski P, Mitka K, Ossowska K, Kolarska Z. Tetrahe-dron, 2005, 61: 1933

[16] Chinnusamy T, Reiser O. ChemSusChem, 2010, 3: 1040

[17] Maurya M R, Kumar M, Kumar U. J Mol Catal A, 2007, 273: 133

[18] Kharat A N, Bakhoda A, Hajiashrafi T. J Mol Catal A, 2010, 333: 94

[19] Anisimov A V, Fedorova E V, Lesnugin A Z, Senyavin V M, Aslanov L A, Rybakov V B, Tarakanova A V. Catal Today, 2003, 78: 319

[20] Jarrais B, Silva A R, Freire C. Eur J Inorg Chem, 2005: 4582

[21] Pereira C, Pereira A M, Quaresma P, Tavares P B, Pereira E, Araujo J P, Freire C. Dalton Trans, 2010, 39: 2842

[22] Barbarini A, Maggi R, Muratori M, Sartori G, Sartorio R. Tetrahedron: Asymmetry, 2004, 15: 2467

[23] Pereira C, Silva A R, Carvalho A P, Pires J, Freire C. J Mol Catal A, 2008, 283: 5

[24] Pereira C, Biernacki K, Rebelo S L H, Magalhaes A L, Carvalho A P, Pires J, Freire C. J Mol Catal A, 2009, 312: 53

[25] Jarrais B, Pereira C, Silva A R, Carvalho A P, Pires J, Freire C. Polyhedron, 2009, 28: 994

[26] Zhao D Y, Huo Q Sh, Feng J L, Chmelka B F, Stucky G D. J Am Chem Soc, 1998, 120: 6024

[27] Kim T W, Ryoo R, Kruk M, Gierszal K P, Jaroniec M, Kamiya S, Terasaki O. J Phys Chem B, 2004, 108: 11480

[28] Lee C H, Lin T S, Mou C Y. J Phys Chem B, 2003, 107: 2543

[1] 孟庆森, 申勇立, 徐晶, 巩金龙.Au(111) 表面上乙醇选择性氧化反应机理的密度泛函理论研究[J]. 催化学报, 2012,33(3): 407-415

[2] 佘育生, 孙伟华, 詹瑛瑛, 林性贻, 郑起.$Au/Cu_xMn_yO_z$ 催化剂的制备、表征及其 CO 消除性能[J]. 催化学报, 2011,32(7): 1220-1226

[3] 袁程远, 陈静.介孔硅担载磷钨杂多酸催化剂的制备及其对环戊烯氧化反应的催化性能[J]. 催化学报, 2011,32(7): 1191-1198

[4] 方雯, 葛庆杰, 俞佳枫, 徐恒泳.组合催化剂上丙烷选择氧化制丙烯酸[J]. 催化学报, 2011,32(6): 1022-1026

[5] 张海, 刘英, 张勋高.碳包铁负载纳米钯催化苯甲醇选择氧化[J]. 催化学报, 2011,32(11): 1693-1701

[6] 李春光 1, 缪长喜2, 聂颖颖 1, 乐英红 1, 顾松园 2, 杨为民 2, 华伟明 1, 高滋 1.CO2 气氛下 MCF 负载氧化钒催化剂上乙苯脱氢反应[J]. 催化学报, 2010,26(8 993-998