高等学校化学学报 2010, 31(2) 325-329 DOI: ISSN: 0251-0790 CN: 22-1131/O6

论文

钼基复合氧化物在异丁烯选择氧化制甲基丙烯醛反应中的催化性能

曲渊立, 刘士艳, 王振旅, 徐家宁

吉林大学化学学院, 长春 130012

摘要:

研究了添加不同助剂对钼基复合氧化物催化剂对异丁烯选择性氧化制备甲基丙烯醛反应的影响. 结合XRD, TPR 和FTIR等表征手段对催化剂的结构进行了研究. 结果表明, 加入适量的铋能够提高催化剂的性能, 铁和钴元素能明显改变催化剂结构和表面性能, 从而提高异丁烯的转化率和甲基丙烯醛的选择性. 同时发现某种特定晶相及晶相之间的协同作用是提高催化剂性能的关键.筛选出在最佳催化剂上异丁烯的转化率为99.9%, 甲基丙烯醛的选择性为88.7%.

关键词: 钼; 金属复合氧化物; 异丁烯; 选择氧化

Selective Oxidation of Isobutene to Methacrolein over Molybdenum-based Multiphasic Oxide Catalysts

QU Yuan-Li, LIU Shi-Yan, WANG Zhen-Lü*, XU Jia-Ning*

College of Chemistry, Jilin University, Changchun 130012, China

Abstract:

The molybdenum-based multiphasic oxide catalysts were prepared and tested in the selective oxidation of isobutylene to methacrolein reaction. The structure and crystal phase of catalysts were characterized by means of XRD, TPR and FTIR methods. The characterization results showed that the adding of bismuth into molybdenum catalysts could enhance the catalytic performance. The adding of iron and cobalt could change the structure and crystal phase of catalysts and significantly improved the conversion of isobutene and selectivity of methacrolein. The results indicate that the synergetic or cooperation effects between multiphasic oxides and the some special phases may be the key role for increasing the catalytic performance. The conversion of isobutene and selectivity of methacrolein can reached 99.9% and 88.7% over the best composed catalyst, respectively.

Keywords: Molybdenum; Multiphasic oxide; Isobutene; Selective oxidation

收稿日期 2009-06-30 修回日期 网络版发布日期

DOI:

基金项目:

通讯作者: 王振旅, 男, 博士, 副教授, 主要从事多相催化研究. E-mail: wangzhenlv@yahoo.com.cn; 徐家宁, 男, 博士, 教授, 博士生导师, 主要从事功能无机化合物合成研究. E-mail: xujn@jlu.edu.cn

作者简介:

参考文献:

[1]ZHU Wan-Chun(朱万春), JIA Ming-Jun(贾明君), WANG Zhen-Lü(王振旅), et al.. Chem. J. Chinese Universities(高等学校化学学报)[J], 2007, 28(2): 334—337
[2]Ono T., Utsumi K., Kataoka M., et al.. Catalysis Today[J], 2002, 91/92: 181—184
[3]Carrazan S. R. G., Martin C., Mateos R., et al.. Catalysis Today[J], 2006, 112: 121—125
[4]Takita Y., Xia Q., Kikutani K., et al.. Journal of Molecular Catalysis[J], 2006, 248: 61—69
[5]WANG Lei(王蕾), LI Zeng-Xi(李增喜), ZHANG Suo-Jiang(张锁江), et al.. The Chinese Journal of Process Engineering(过程工程学报)[J], 2007, 7 (1): 202—208
[6]CAI Tie-Jun(蔡铁军), YU Chang-Lin(余长林), DENG Qian(邓谦), et al.. Chinese Journal of Catalysis(催化学报)[J], 2003, 24 (12): 951—956
[7]Song N. X., Rhodes C., Bartley J. K., et al.. Journal of Catalysis[J], 2005, 236: 282—291

[8]Gaigneaux E. M., Genet M. J., Ruiz P., et al.. J. Phys. Chem. B[J], 2000, 104: 5724—5737
[9]Guan J. Q., Jia M. J., Jing S. B., et al.. Catalysis Letters[J], 2006, 108 (3/4): 125—129
[10]WANG Lei(王蕾), LI Zeng-Xi(李增喜), ZHANG Suo-Jiang(张锁江), et al.. Chinese J. Chem. Eng.(中国化学工程)[J], 2005, 13(5): 705—708
[11]Grzybowska B., Haber J., Komorek J., et al.. Journal of Catalysis[J], 1972, 25: 25—32
[12]Lin M. H., Desai T. B., Kaiser F. W., et al.. Catalysis Today[J], 2000, 61: 223—229
[13]Nagai K.. Applied Catalysis A[J], 2001, 221: 367—377
[14]Jung J. C., Lee H., Kim H., et al.. Catalysis Communications[J], 2008, 9: 1676—1680
[15]Jung J. C., Lee H., Seo J. G., et al.. Catalysis Today[J], 2009, 141: 325—329
[16]Jung J. C., Lee H., Kim H., et al.. Catalysis Communications[J], 2008, 9: 2059—2062
[17]Guan J. Q., Wu S. J., Wang H. S., et al.. Journal of Catalysis[J], 2007, 251: 354—362
[18]YU Chang-Lin(余长林), CAI Tie-Jun(蔡铁军), DENG Qian(邓谦), et al.. Chemical Research and Application(化学研究与应用)[J], 2003, 15 (6): 855—856
[19]Carrazan S. R. G., Martin C., Rives V., et al.. Applied Catalysis A[J], 1996, 135: 95—123
[20]Well W. J. M., Le M. T., Schiodt N. C., et al.. Journal of Molecular Catalysis A: Chemical[J], 2006, 256: 1—8
[21]Jo B. Y., Kim E. J., Moon S. H.. Applied Catalysis A[J], 2007, 332: 257—262
[22]ZHU Bai-Chun(朱百春), LI Hong-Bo(李洪波), SHENG Shi-Shan(盛世善), et al.. Chinese Journal of Catalysis(催化学报)[J], 2004, 25(4): 277—281
[23]Ma W. P., Kugler E. L., Wright J., et al.. Energy & Fuels[J], 2006, 20: 2299—2307
[24]CAI Tie-Jun(蔡铁军), DENG Qian(邓谦), HUANG De-Fa(黄德发), et al.. Chinese Journal of Inorganic Chemistry(无机化学学报)[J], 2002, 18 (6): 602—606
[25]Liu X. H., Shen K., Wang Y. G., et al.. Catalysis Communications[J], 2008, 9: 2316—2318
[26]Munteanu G., Ilieva L., Andreeva D.. Thermochimica Acta[J], 1997, 291: 171—177
[27]Mhamdi M., Zine S. K., Ghorbel A.. Applied Catalysis A[J], 2009, 357: 42—50
[28]Ji Y., Zhao Z., Duan A. J., et al.. J. Phys. Chem. C[J], 2009, 113: 7186—7199
[29]SUN Rui-Qing(孙瑞卿), GU Xiao-Yan(辜晓燕), ZHANG Han-Hui(张汉辉), et al.. Spectroscopy and Spectral Analysis(光谱学与光谱分析)[J], 2000, 20 (6): 857—859
[30]WANG Guo-Jia(王国甲), WU Tong-Hao(吴通好), YANG Hong-Mao(杨洪茂), et al.. Chem. J. Chinese Universities(高等学校化学学报)[J], 1994, 15 (12): 1845—1847
[31]Bordes E.. Topics in Catalysis[J], 2001, 15 (2—4): 131—137
[32]Porta P., Jacono M. L., Valigi M., L., et al.. Journal of Catalysis[J], 1986, 100: 86—94

本刊中的类似文章

文章评论

反馈人		邮箱地址	
反馈标题		验证码	8651