Chinese Journal of Chemistry 2005 23 (10): 1333-1338 ISSN: 0567-7351 CN: 31-1320/06

Full Papers

催化剂**Pd/TiO$_2$-Al$_2$O$_3$**低温下催化甲烷燃烧活性及**^{18}O**同位素交换性能

林伟[1]，林莉[1]，朱月香*[,a]，谢有畅[1]，K. Scheurell,[2] E.Kemnitz[2]

[1]北京大学化学与分子工程学院物理化学研究所，北京100871

[2] Institute of Chemistry, Humboldt University, Brook Taylor Street2, Berlin D-12489, Germany

收稿日期 2004-12-8 修回日期 2005-6-21 网络版发布日期 接受日期

摘要 本文详细研究了用共沉淀法制备出的TiO$_2$-Al$_2$O$_3$复合氧化物载体负载钯之后的催化剂催化甲烷燃烧的性能。所有的Pd/TiO$_2$-Al$_2$O$_3$催化剂均具有比单一氧化物载体负载的钯催化剂Pd/Al$_2$O$_3$和Pd/TiO$_2$好的活性；其中Pd/2Ti-3Al 在质量空速为33000 mL/(h·g)时T$_{90\%}$只有395^{o}C，这比Pd/Al$_2$O$_3$和Pd/TiO$_2$的T$_{90\%}$低了不止50^{o}C。TPR和^{18}O同位素交换的结果表明Pd/2Ti-3Al高的催化甲烷燃烧活性是由于其高的氧交换活性和适中的还原性，这也符合我们前面工作中的结论。XPS的结果表明在我们的研究范围内钯的分散度并不是影响催化剂活性的关键因素。

关键词 还原性, 氧交换活性

分类号

Novel Pd/TiO$_2$-Al$_2$O$_3$ Catalysts for Methane Total Oxidation at Low Temperature and Their ^{18}O-Isotope Exchange Behavior

LIN Wei[1], LIN Li[1], ZHU Yue-Xiang*[,1], XIE You-Chang[1], SCHEURELL, K.[2], KEMNITZ, E.[2]

[1] State Key Laboratory for Structural Chemistry of Unstable and Stable Species, College of Chemistry and Molecular Engineering, Peking University, Beijing 100871, China

[2] Institute of Chemistry, Humboldt University, Brook Taylor Street 2, Berlin D-12489, Germany

Abstract Pd supported on TiO$_2$-Al$_2$O$_3$ binary oxides prepared by coprecipitation method has been investigated for the total oxidation of methane. All Pd/TiO$_2$-Al$_2$O$_3$ catalysts show higher activity than Pd/Al$_2$O$_3$ and Pd/TiO$_2$. Among them, Pd/2Ti-3Al with a Ti/Al ratio of 2 to 3 has a $T_{90\%}$ of 395 ℃ at a gas hourly mass velocity of 33000 mL/(h•g), which is at least 50 ℃ lower than that of Pd supported on single metal oxide Al$_2$O$_3$ or TiO$_2$. The results of TPR and ^{18}O-isotope exchange experiments demonstrated that the excellent activity of Pd/2Ti-3Al was due to its high oxygen mobility and moderate reducibility, which is in accordance with our previous work. XPS results indicated that the dispersion of Pd was not the key factor to influence the catalytic activity.

Key words methane total oxidation palladium TiO$_2$-Al$_2$O$_3$ composite reducibility oxygen mobility

DOI:

通讯作者 朱月香 zhuyx@pku.edu.cn