

非碱性条件下不同粒径的碳载体负载 Pt 催化剂上甘油的选择性氧化

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摘要 采用浸渍法制备了不同粒径的活性炭负载的 Pt 催化剂, 并运用扫描电镜、N₂ 吸附-脱附、透射电镜和 X 射线衍射对催化剂进行了表征。结果表明, 当活性炭载体的粒径从 253.2 μm 下降至 9.3 μm 时, 其表面积或孔体积变化不大, Pt 颗粒高度分散于载体表面, 平均粒径为 2.8~5.5 nm。这些高度分散的 Pt 催化剂在非碱性条件下的甘油氧化反应中表现出较高的活性, 且随着载体粒径的减小而明显提升。其中粒径为 9.3 μm 的活性炭负载的 Pt 催化剂上, 游离的甘油酸收率达到 47.6%, 且催化剂可以重复使用。

关键词: 甘油氧化 非碱性条件 载体尺寸 活性炭 铂

Abstract: Recent progress in the selective oxidation of biodiesel glycerol in aqueous solution by Au, Pt and alloy catalysts was reviewed. A series of Pt catalysts on different sized carbon supports were prepared and characterized by scanning electron microscopy, N₂ adsorption, transmission electron microscopy, and X-ray powder diffraction. The average particle size of the carbon supports was decreased from 253.2 to 9.3 μm by ball milling, but their surface area and pore volume were only slightly changed. Pt was highly dispersed on these different sized carbon supports with an average particle size between 2.8 - 5.0 nm. Glycerol oxidation was catalyzed by these highly dispersed Pt catalysts in a base-free aqueous solution. The activity of the Pt catalysts increased with decreasing particle size of the carbon support, which was attributed to the higher accessibility of reactants to the Pt nanoparticles. The best yield of glyceric acid reached 46.7% and the catalyst was stable during six recycles.

Keywords: glycerol oxidation, base-free solution, support size, carbon support, platinum

收稿日期: 2012-03-10; 出版日期: 2012-07-06












引用本文:

张梦媛, 梁丹, 聂仁峰等. 非碱性条件下不同粒径的碳载体负载 Pt 催化剂上甘油的选择性氧化[J] 催化学报, 2012,V33(8): 1340-1346

ZHANG Meng-Yuan, LIANG Dan, NIE Ren-Feng etc. Oxidation of Biodiesel Glycerol over Pt Supported on Different Sized Carbon Supports in Base-Free Solution[J] Chinese Journal of Catalysis, 2012,V33(8): 1340-1346

链接本文:

http://www.chxb.cn/CN/10.1016/S1872-2067(11)60411-7 或 http://www.chxb.cn/CN/Y2012/V33/I8/1340

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