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论文

以TiO_2多孔微球为载体的CuO/TiO_2催化剂的制备、表征及CO氧化催化性能

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摘要:

利用高分子反相悬浮聚合技术结合溶胶-凝胶法制备了纳米TiO_2晶粒组成的多孔微球. 以TiO_2多孔微球为载体, 利用浸渍法制备了CuO/TiO_2催化剂, 用示差扫描量热法、热重分析、X 射线衍射和X射线光电子能谱(XPS)对TiO_2多孔微球和催化剂进行了表征, 并对其进行了CO催化氧化性能的评价. 结果表明, 于500 ℃焙烧的TiO_2多孔微球基本为锐钛矿型结构, 其粒径为19.5 nm. XPS结果表明, 催化剂中载体和活性组分存在相互作用, Cu除了以Cu^{2+}的形式存在外, 还以部分Cu^{+}和Cu^{0}的形式存在. CO催化氧化研究结果表明, 催化剂的催化活性与浸渍液的浓度和催化剂的焙烧温度有关. 用0.5 mol/L $Cu(NO_3)_2·3H_2O$溶液浸渍得到的催化剂和于200 ℃焙烧得到的催化剂具有较好的催化活性.

关键词: 二氧化钛 多孔微球 浸渍法 CO催化氧化 CuO/TiO_2催化剂

Preparation, Characterization and CO Oxidation Catalytic Properties of CuO/TiO_2 Catalysts Supported on Porous Microspheres Composed of TiO_2 Nanocrystals

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Abstract:

The porous TiO_2 microspheres were prepared by the reversed-phase suspension polymerization and sol-gel method. The CuO/TiO_2 catalysts with porous microspheres composed of TiO_2 nanocrystals as the support were prepared by impregnation method. The properties of the porous TiO_2 microspheres and CuO/TiO_2 catalysts were studied by TG-DTA, X-ray diffraction, XPS and ICP. The catalytic properties of the catalysts for CO oxidation were studied *via* a microreactor-GC system. The results show that the porous microspheres were mainly composed of anatase TiO_2 nanocrystals with a size of 19.5 nm. The XPS results indicate that there was interaction between the support and the active component, and Cu mainly existed as Cu^{2+} with some other form. The catalytic activity of the catalysts depends on the concentration of the impregnation solution and the calcination temperature of the CuO/TiO_2 catalysts. The catalyst impregnated in 0.5 mol/L $Cu(NO_3)_2·3H_2O$ had a better catalytic activity. The optimum calcination temperature of the CuO/TiO_2 catalysts was 200 ℃.

Keywords: Titanium dioxide Porous microsphere Impregnation method CO oxidation CuO/TiO_2 catalyst

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