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二氧化硅孔结构对CO氧化用担载型纳米金催化剂的影响

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Impact of silica porosity on the catalytic activity of nanosize gold catalyst for CO oxidation

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摘要 采用三种不同孔结构的二氧化硅材料为载体,应用沉积沉淀法制备担载型纳米金催化剂。以CO催化氧化为模型反应,并结合低温N_2吸附脱附、X射线物相分析、X射线光电子能谱和透射电镜等技术考察三种二氧化硅载体对纳米金催化剂结构和性能的影响。结果表明,催化剂中金纳米颗粒与载体孔结构呈现出良好的对应关系,比表面积大、孔径小且分布均匀的二氧化硅制备的金催化剂颗粒粒径最小,CO氧化活性最高。在18 000 mL/(h·g_{cat})、$V(CO)/V(O_2)/V(Ar)=1/21/78$的反应条件下,其CO完全转化温度为560 K。

关键词: 金催化剂　一氧化碳氧化　二氧化硅　孔结构

Abstract: Series of nanosize gold catalysts supported by three kinds of silica with different structures were prepared by deposition-precipitation.The CO oxidation was utilized as a probe.The impacts of silica on the structure and catalytic activity were characterized by low-temperature N_2 adsorption/desoprtion,X-ray diffraction (XRD),X-ray photoelectron spectroscopy (XPS),and transmission electron microscope (TEM).The result turns out that the relationship between the gold nanopaticle size and the support's structure does exist.The higher surface area and the smaller pore size of the silica support corresponding to a smaller gold nanoparticle size and higher activity of CO oxidation.The total CO conversion under 18 000 mL/(h·g_{cat}) with gas ratio of $V(CO)/V(O_2)/V(Ar)=1/21/78$ is 560 K.

Key words: gold catalyst　CO oxidation　silica　pore structure

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