[1]卫 巍,仲崢嵘,焦晓新,等.壳聚糖促进Au/碳纳米管复合材料的合成机理及催化性能[J].厦门大学学报(自然科学版),2013,52(05):643.[doi:10.6043/j.issn.0438-0479.2013.05.012]

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壳聚糖促进Au/碳纳米管复合材料的合成机

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Title: Understanding Chitosan-mediated Synthesis of Au/Carbon Nanotube Nanohybrids and Its Catalytic Performance

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关键词: Au; 壳聚糖; 碳纳米管; 纳米复合材料; 催化性能

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摘要: 利用循环伏安法,结合其他谱学表征技术,如SEM/HRTEM,XRD和XPS对Au/碳纳米管复合材料合成过程中壳聚糖和碳纳米管的协同作用进行了探讨.研究结果表明,壳聚糖不仅提高了碳纳米管在水溶液中的分散性和稳定性,锚定Au纳米粒子于碳纳米管载体表面以防止他们迁移/聚结,更重要的是,其还能够通过降低碳纳米管的还原电势来促进Au^{3+}的自发还原.谱学表征结果表明,相对于纯碳纳米管而言,壳聚糖缠绕的碳纳米管上形成了一种还原电位更低的新还原位,从而使Au离子与碳纳米管间的还

原电势差值明显增大,由此引发了壳聚糖与碳纳米管对Au^{3+}的协同还原效应.该类Au/碳纳米管复合材料的应用进一步的研究结果表明,其对在水溶液中催化$NaBH_4$还原对硝基苯酚反应表现出很高的活性

Abstract: The synergistic effect of chitosan and carbon nanotube in synthesis of Au-carbon nanotube nanohybrids were investigated by cyclic voltammograms measurement,combined with various characteristic techniques,such as SEM/HRTEM,XRD and XPS.The present results reveal that the role of chitosan is not only just to disperse CNTs steadily in aqueous solution as well as to anchor Au nano-particles preventing them from migrating/agglomerating on the carbon nanotubes support,but also to adjust carbon nanotubes reduction potential responsible for reduction of Au ions.Those results in addition provide solid evidence that the formation of a new active site,located on the surface of chitosan wrapped carbon nanotubes,is directly related to such cooperative effect.The markedly down shifting of reduction potential of the new active site results in the increasing difference in reduction potential between Au ions and carbon nanotubes,hence,improving spontaneous deposition of Au ions.Moreover,the Au-carbon nanotube nanohybrids has also shown highly effective catalytic performance for reduction of 4-nitrophenol by sodium borohydride in aqueous solution.

参考文献/References:

[1] Alivisatos A P.Semiconductor clusters,nanocrystals,and quantum dots[J].Science,1996,271:933-937.
[2] Lu W,Jin Y,Wang G,et al.Enhanced photoelectrochemical method for linear DNA hybridization detection using Au-nanopaticle labeled DNA as probe onto titanium dioxide electrode[J].Biosensors and Bioelectronics,2008,23(10):1534-1539.
[3] Xiao S,Liu F,Rosen A E,et al.Selfassembly of metallic nanoparticle arrays by DNA scaffolding[J].Journal of Nanoparticle Research,2002,4(4):313-317.
[4] Sharma A K,Gupta B D.Fibre-optic sensor based on surface plasmon resonance with Ag Au alloy nanoparticle films[J].Nanotechnology,2006,17(1):124.
[5] Zhang X,Wang H,Xu B Q.Remarkable nanosize effect of zirconia in Au/ZrO2 catalyst for CO oxidation [J].The Journal of Physical Chemistry B,2005,109(19):9678-9683.
[6] Hao Y,Chong Y,Li S,et al.Controlled synthesis of Au nanoparticles in the nanocages of SBA-16:improved activity and enhanced recyclability for the oxidative esterification of alcohols[J].The Journal of Physical Chemistry C,2012,116(11):6512-6519.
[7] Yang J H,Henao J D,Raphulu M C,et al.Activation of Au/TiO_2 catalyst for CO oxidation[J].The Journal of Physical Chemistry B,2005,109(20):10319-10326.
[8] Overbury S H,Ortiz-Soto L,Zhu H,et al.Comparison of Au catalysts supported on mesoporous titania and silica:investigation of Au particle size effects and metal-support interactions[J].Catalysis letters,2004,95(3-4):99-106.
[9] Brust M,Kiely C J.Some recent advances in nanostructure preparation from gold and silver particles:a short topical review[J].Physicochem Eng Asp,2002,202(2/3):175-186.
[10] Rylander P N.Catalytic hydrogenation in organic synthesis[M].New York,London:Academic Press,1979.
[11] Nhut J M,Vieira R,Pesant L,et al.Synthesis and catalytic uses of carbon and silicon carbide nanostructures[J].Catal Today,2002,76(1):11-32.

[12] Ledoux M J,Vieira R,Pham-Huu C,et al.New catalytic phenomena on nanostructured(fiber and tubes)