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Golden Carbon Nanotube Membrane for Continuous Flow Catalysis

(Article) [\(Open Access\)](#)Liu, Y.^{a,c} ✉, Zheng, Y.^{b,d}, Du, B.^b, Nasaruddin, R.R.^b, Chen, T.^b, Xie, J.^b ✉ ^aSchool of Environmental Science and Engineering, Donghua University, 2999 North Renmin Road, Shanghai, 201620, China^bDepartment of Chemical and Biomolecular Engineering, National University of Singapore, 4 Engineering Drive 4, Singapore, 117585, Singapore^cNUS Environmental Research Institute, National University of Singapore, 5A Engineering Drive 1, Singapore, 117411, Singapore[View additional affiliations](#) 


Abstract

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In this work, a high-performance catalytic membrane, composed of ultrasmall gold nanoclusters (AuNCs) and high aspect-ratio carbon nanotubes (CNTs), was designed for the continuous-flow catalytic reactions. In this hybrid catalytic membrane, the Au core of the NCs serves as high-performance catalyst, and the ligand of the NCs plays two key roles: (1) as a well-defined surfactant assembly to effectively dissolve CNTs in aqueous solution and (2) as an efficient protecting ligand for Au core to avoid agglomeration. Due to the above-mentioned features, a homogeneous 3D self-support catalytic membrane can be readily fabricated by vacuum filtration of the hybrid AuNCs/CNTs. The catalytic activity of the as-designed catalytic membrane was evaluated using 4-nitrophenol hydrogenation as a model catalytic reaction. The data suggest that the continuous flow catalytic reactor could achieve complete conversion of the substrate (i.e., 4-nitrophenol) within a single flow through the membrane with a hydraulic residence time (τ) of 3.0 s. The catalytic membrane also showed enhanced catalytic kinetics as compared to the conventional batch reactor due to the convectively enhanced mass transfer. In addition, three important parameters, including the Au loading amount, substrate concentration, and flow rate, were identified as key factors that could affect the performance of the catalytic membrane. (Figure Presented). © 2017 American Chemical Society.

SciVal Topic Prominence

Topic: Nanoclusters | Gold | fluorescent gold

Prominence percentile: 99.952 

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Indexed keywords

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controlled terms:

Aspect ratio Batch reactors Carbon Carbon nanotubes Catalysis Filtration Gold
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- 1 Xia, X., Wang, Y., Ruditskiy, A., Xia, Y.
25th anniversary article: Galvanic replacement: A simple and versatile route to hollow nanostructures with tunable and well-controlled properties

(2013) *Advanced Materials*, 25 (44), pp. 6313-6332. Cited 435 times.
doi: 10.1002/adma.201302820

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- 2 Fang, J., Zhang, B., Yao, Q., Yang, Y., Xie, J., Yan, N.
Recent advances in the synthesis and catalytic applications of ligand-protected, atomically precise metal nanoclusters

(2016) *Coordination Chemistry Reviews*, 322, pp. 1-29. Cited 118 times.
<http://www.journals.elsevier.com/coordination-chemistry-reviews/>
doi: 10.1016/j.ccr.2016.05.003

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