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Rational Design of High-Performance Continuous-Flow Microreactors Based on Gold Nanoclusters and Graphene for Catalysis (Article)

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Abstract

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In this work, we rationally designed a high-performance microreactor system for continuous-flow catalysis. The membrane consists of ultrasmall gold nanoclusters (AuNCs) and two-dimensional graphene. The Au cores of the NCs act as catalysts, while their ligands have two functions: (1) protecting the Au cores to avoid agglomeration and (2) providing a well-defined surfactant assembly to disperse graphene in aqueous solution. Hydrogenation of 4-nitrophenol (4-NP) was employed as model reaction to evaluate catalytic activity. The catalytic membrane microreactor demonstrated excellent catalytic activity and stability, where complete 4-NP conversion was readily achieved via a single pass through the membrane. This desirable performance was maintained over 12 h of continuous operation, although a certain amount of organic buildup on the membrane was observed. The catalytic membrane microreactor outperforms conventional batch reactors due to its improved mass transport. 4-NP-spiked real water samples were also completely converted. This study provides new insights for the rational design of membrane reactors for industrial applications. © 2018 American Chemical Society.

SciVal Topic Prominence [i](#)

Topic: Nanoclusters | Gold | fluorescent gold

Prominence percentile: 99.952 [i](#)

Reaxys Database Information

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Author keywords

4-Nitrophenol [Catalytic membrane microreactor](#) [Gold nanoclusters](#) [Reduced graphene oxide](#)

Indexed keywords

Engineering controlled terms: [Batch reactors](#) [Bioreactors](#) [Catalysis](#) [Graphene](#) [Membranes](#) [Nanoclusters](#) [Solutions](#) [Structural design](#)[Metrics](#) [View all metrics >](#)

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Engineering main heading:

Catalyst activity

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