
[Skip to Main Content](#) if(true) { document.getElementById("skipNavigationLink").onclick =function skipElement () { var element = document.getElementById('article__content'); if(element == null || element == undefined) { element = document.getElementsByClassName('article__content').item(0); } element.setAttribute('tabindex','0'); element.focus(); } }



[Access byCAS - National Science Library](#)

[Access byCAS - National Science Library](#)

- [This Journal](#)
- [Anywhere](#)

-
-

[Login / Register](#)

The full text of this article hosted at iucr.org is unavailable due to technical difficulties.

googletag.cmd.push (function () { googletag.display ('advert-leaderboard'); }); _

[Bulletin of the Korean Chemical Society](#)

[Volume 38, Issue 6](#)

Novel Gallium Polyoxometalate/Nano γ -Fe \cdot Gold Hybrid Material Supported on Nano γ -Fe \cdot -sized Silica for Mild Cyclohexene Oxidation Using Molecular Oxygen

[Umsa Jameel](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Mingqiao Zhu](#)

Corresponding Author

E-mail address: zhumingqiao@zju.edu.cn

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Xinzhi Chen](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Hengquan Chen](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and

Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Nousheen Iqbal](#)

State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Materials Science and Engineering, Donghua University, Shanghai, China

[Search for more papers by this author](#)

[Zhangfa Tong](#)

Guangxi Key Laboratory of Petrochemical Resource Processing and Process Intensification Technology, School of Chemistry and Chemical Engineering, Guangxi University, Nanning, China

[Search for more papers by this author](#)

[Satmon John Timayo](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Umsa Jameel](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Mingqiao Zhu](#)

Corresponding Author

E-mail address: zhumingqiao@zju.edu.cn

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Xinzhi Chen](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Hengquan Chen](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

[Nousheen Iqbal](#)

State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Materials Science and Engineering, Donghua University, Shanghai, China

[Search for more papers by this author](#)

[Zhangfa Tong](#)

Guangxi Key Laboratory of Petrochemical Resource Processing and Process Intensification Technology, School of Chemistry and Chemical Engineering, Guangxi University, Nanning, China

[Search for more papers by this author](#)

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China

[Search for more papers by this author](#)

First published: 22 May 2017

<https://doi.org/10.1002/bkcs.11135>

[Read the full text](#)

[About](#)

[PDF](#)

[PDF](#)

[Tools](#)

- [Request permission](#)
- [Export citation](#)
- [Add to favorites](#)
- [Track citation](#)

[Share](#)

Give access

[Share full text access](#)

Share full text access

Share a link

- [Email to a friend](#)
- [Facebook](#)
- [Twitter](#)
- [Linkedin](#)
- [Google+](#)
- [Reddit](#)
- [CiteULike](#)

Abstract

Selective oxidation of olefins using molecular oxygen is a great challenge. This study reports two types of novel eco-friendly heterogeneous hybrid catalysts. One comprises of a lacunary Keggin-type polyoxometalate (POM) GaW_{11} linked to nano-sized silica using (3-aminopropyl) triethoxysilane (APTES) to form $\text{GaW}_{11}\text{-APTES@SiO}_2$. Another catalyst is $\text{Au/GaW}_{11}\text{-APTES@SiO}_2$ prepared by wet deposition of nano-gold on the former one. The catalysts were characterized and used for the solvent-free oxidation of cyclohexene with molecular oxygen under mild reaction conditions. Both the catalysts showed good conversion and significant selectivity towards oxidized products for cyclohexene. $\text{GaW}_{11}\text{-APTES@SiO}_2$ showed a high conversion of up to 62.02% with a selectivity of 59.13% towards epoxide at a mild temperature of 50°C. $\text{Au/GaW}_{11}\text{-APTES@SiO}_2$ showed a conversion of 69.32% with

57.34% selectivity to 2-ethylcyclohexene-1-ol at a temperature of 80 °C. The heterogeneous catalysts were reused several times with no significant loss in conversion or selectivity towards the oxidized products.

[Volume 38, Issue 6](#)

June 2017

Pages 614-624

googletag.cmd.push (function () { googletag.display ('advert-rail-1'); }); _

- [Related](#)
- [Information](#)

•

•

googletag.cmd.push (function () { googletag.display ('advert-rail-2'); }); _

•

```
var articleRef = document.querySelector('.article__body:not(.show-references) .article__references');
if (articleRef) { articleRef.style.display = "none"; }
```

[Caption](#)

Additional links

About Wiley Online Library

- [Privacy Policy](#)
 - [Terms of Use](#)
 - [Cookies](#)
 - [Accessibility](#)
-

Help & Support

- [Contact Us](#)

Opportunities

- [Subscription Agents](#)
- [Advertisers & Corporate Partners](#)

Connect with Wiley

- [The Wiley Network](#)
- [Wiley Press Room](#)

Log in to Wiley Online Library

[NEW USER >](#) [INSTITUTIONAL LOGIN >](#)

Change Password

Congrats!

Your password has been changed

Create a new account

[Returning user](#)

Forgot your password?

Enter your email address below. If your address has been previously registered, you will receive an email with instructions on how to reset your password. If you don't receive an email, you should register as a new user

Please check your email for your password reset instructions.

Request Username

Can't sign in? Forgot your username?

Enter your email address below and we will send you your username

If the address matches an existing account you will receive an email with instructions to retrieve your username

```
if(window._satellite) { _satellite.pageBottom(); }
```

```
var _prum=[[id,'59e8fecb3847311aab7b23c6'],[mark,'firstbyte',(new Date()).getTime()]];function(){var s=document.getElementsByTagName('script')[0],p=document.createElement('script');p.async='async';p.src='//rum-static.pingdom.net/prum.min.js';s.parentNode.insertBefore(p,s);}();
```