

# Heterogeneous ethylene hydroformylation enables highly efficient industrial production of propanal/n-propanol

May 16 2022, by Li Yuan

---



The industrial facility of 50 kt/year propanal/n-propanol by heterogeneous ethylene hydroformylation. Credit: LI Cunyao

Olefins, hydrogen, and carbon monoxide can be converted to aldehydes by the hydroformylation of olefins. Upon further conversion, chemicals including alcohols, acids, and esters are obtained.

However, commercial hydroformylation mainly employs homogeneous technology, which can cause problems including separation between catalyst and product, leaching of precious metals and ligands, massive solvent issues, and inefficient use of heat from the exothermic reaction.

Now, a research team led by Prof. Ding Yunjie and Prof. Yan Li from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS) has realized the highly-efficient industrial production of propanal/n-propanol via heterogeneous ethylene hydroformylation.

Based on heterogeneous ethylene hydroformylation technology, the facility with propanal/n-propanol yield of 50 kt/year was put into operation in August 2020 in Ningbo, China. So far, it has been in stable operation for 22 months.

The heterogeneous hydroformylation technology adopts porous organic polymers with large specific surface area and hierarchical porous structure as both carrier and ligand. It metalates rhodium ions to form single-Rh-sites catalyst with good performance and high stability using multiple Rh-P coordination bonds.

"The utilization rate of precious metals of this heterogeneous hydroformylation technology is nearly 100%, thereby making the leaching of precious metals and ligand negligible," said Prof. Ding. "And there is no cost in the separation of catalyst and product in this process."

"The reaction system is solvent-free, and the products have high purity. Moreover, a large amount of low-grade reaction heat can be efficiently used in the hydroformylation and hydrogenation reaction," said Prof. Yan.

Provided by Chinese Academy of Sciences

Citation: Heterogeneous ethylene hydroformylation enables highly efficient industrial production of propanal/n-propanol (2022, May 16) retrieved 28 June 2024 from

<https://phys.org/news/2022-05-heterogeneous-ethylene-hydroformylation-enables-highly.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.