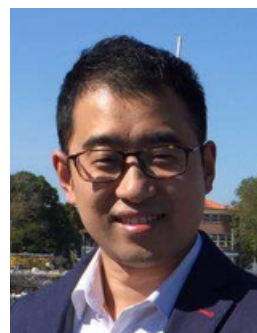


Anderson-type polyoxometalates support on orange peel activated carbon for efficient ethyl levulinate production

Deyang ZHAO

School of Chemistry and Materials Science, Ludong University,
Yantai, CHINA
deyang.zhao@ldu.edu.cn



Ethyl levulinate (EL) is hailed as the ideal lipid chemical derived from biomass due to its low toxicity, high lubricity, and low temperature fluidity, making it suitable as a fuel additive for gasoline, diesel, etc [1-3].

This study highlights a series of Anderson-type polyoxometalates (POMs), namely $(\text{Na}_3\text{H}_6\text{FeMo}_6\text{O}_{24})$ (FeMo_6), $(\text{NH}_4)_4\text{H}_6\text{ZnMo}_6\text{O}_{24}$ (ZnMo_6), $(\text{NH}_4)_3\text{H}_6\text{CoMo}_6\text{O}_{24}$ (CoMo_6), and $(\text{NH}_4)_4\text{H}_6\text{CuMo}_6\text{O}_{24}$ (CuMo_6)-orange peel activated carbon (OPAC) catalysts, which are synthesized for the production of EL from furfural alcohol (FAL). Impressively, 20% ZnMo_6 -OPAC possesses suitable total acidic strength ($3.3 \text{ cm}^3 \text{ g}^{-1}$) with highest Brønsted-Lewis ratio (1.3), enhanced reducibility capacity, as well as a moderate BET surface area ($500.5 \text{ m}^2 \text{ g}^{-1}$) with appropriate pore volume and size (3.5 nm) to afford excellent performance. The active species responsible for the alcoholysis of FAL to EL was identified as e^- through scavenger experiments. From DFT calculation, FAL is more likely to be adsorbed on ZnMo_6 -OPAC (-0.533 eV) than OPAC surface (-0.144 eV), as well as the robust electron transferring capacity of ZnMo_6 -OPAC (-0.3259 e) vs. OPAC (-0.0009 e) after Anderson-type POMs loading. Important intermediates such as ethoxymethylfuran (EMF) and 5-ethoxy-5-(ethyl-oxidaneylidene) pentan-2-one were found through GC-MS. Catalyst recycling showed good performance up to the fifth cycle (70% FAL conversion and 47% EL yield), showcasing its potential for practical application [4].

References

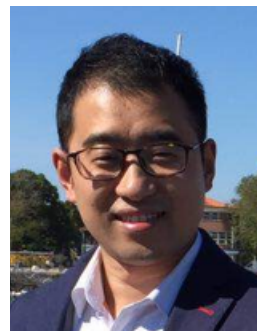
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BIO

Deyang Zhao received his Ph.D. in 2020 from the Université de Technologie de Compiègne (France) under the Supervision of Prof. Christophe Len. The project of his Ph.D. (UT-INSA) was funded by the China Scholarship Council (CSC). He worked as a visiting scholar in the Universidad de Córdoba in Spain in 2017 during the period of his Ph.D, then he moved to Chimie ParisTech until Ph.D. graduation. He has been a lecturer at Ludong University since 2021. In 2023, he studied as a visiting scholar in Tsinghua University under the supervision of Prof. Zhenzhong Yang. His research interests focus on the biomass-based downstream derivatives (furfural, furfuryl alcohol, methyl levulinate, HMF, FDCA etc.) valorization in the intensified process, including microwave heating or continuous flow using ILs, Anderson-type polyoxometalates and Janus materials. He has published more than 40 publications, including *Green Chem.*, *Fuel*, *ACS Sustainable Chem. Eng.*, *ChemSusChem* etc. He is a member of the editorial board of *Chemical Newsletter* and a review editor of *Frontiers in Chemistry*.