

第476回触媒科学研究所コロキウム

Valorizing Glycerol: Sulfonated Carbon Catalyst from Palm Kernel Shell for Efficient Acetylation to Acetins

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2025年1月17日(金) 15:00–16:30

創成科学研究棟 セミナールームB

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The catalytic acetylation of glycerol, a by-product of biodiesel, to acetins (mono-, di-, and triacetin) offers a sustainable route to the production of biofuels and value-added chemicals. In this presentation, a sulfonated carbon catalyst was synthesized from palm kernel shells, an agricultural waste material. It was produced by carbonization and subsequent sulfonation with sulfuric acid to introduce strongly acidic functional groups. The catalyst was characterized using techniques such as CHNS, XRD, Raman, XPS, ammonia-TPD and acid-base titration., FTIR, SEM and acid-base titration. This revealed a porous structure with high acidity and the presence of sulfonic groups ($-\text{SO}_3\text{H}$), which are essential for catalytic activity. Catalytic tests showed high glycerol conversion and selectivity towards diacetin and triacetin under mild conditions. The catalyst also exhibited excellent reusability with negligible performance loss after several cycles. This work highlights the dual benefit of utilizing biomass waste for catalyst production and converting glycerol into valuable chemicals, which is in line with green chemistry principles. The presentation will explore the synthesis, characterization and performance of the sulfonated carbon catalyst and provide insights into its potential for sustainable industrial applications.

Prof. Irmawati Ramli received her PhD in Chemistry from the University of Manchester Institute of Science and Technology, England in 2000. Her research focuses on heterogeneous catalysis for sustainable chemical processes. She initially worked on the selective oxidation of propane to acrylic acid using quaternary MoVTaNbO_x catalysts. With the shift toward green chemistry, she explored converting biodiesel by-product glycerol into valuable chemicals using solid catalysts, including carbon materials derived from palm kernel shells. Her current research extends to the conversion of simple sugars into bio-based chemicals. In 2009, she was seconded to Malaysia's Ministry of Science, Technology and Innovation as Director of the National Science Centre, where she successfully served for five years. Upon completion of her tenure, she was appointed as the Head of the Chemistry Department of Universiti Putra Malaysia (UPM). She is currently a full professor in the Department of Chemistry in the Faculty of Science at UPM. Prof. Irmawati has published over 100 scientific papers, holds 9 patents and is a Fellow of the Malaysian Institute of Chemistry and the Royal Society of Chemistry, United Kingdom.

問合せ先: 中島清隆

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