

Oxidized Phosphorus-Doped Graphitic Carbon Nitride as Efficient Heterogeneous Acid Catalyst for Esterification of Oleic Acid

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The existing fossil fuel reserves are continually declining worldwide; therefore, an appropriate effort is necessary to compensate for this issue. Biodiesel produced from the esterification of free-fatty acids has drawn much attention as a renewable, efficient, and sustainable fuel in recent decades. Especially, the use of waste oil containing free-fatty acids as the raw material can significantly reduce the production costs by fully utilizing the waste feedstock. Lately, the use of heterogeneous acid catalysts is considered to be a more efficient and eco-friendly approach by addressing its environmental and corrosion-related issues, as well as reducing the product purification processes. Herein, this study focused on the development of novel oxidized phosphorus-doped graphitic carbon nitride as the heterogeneous acid catalyst towards esterification with stability confirmed by repeated batch runs. The graphitic carbon nitride-based catalyst was synthesized by phosphorus doping and acid treatment. The catalysts were characterized by XRD, XPS, SEM, BET, IR, and NH₃-TPD. The developed catalyst is expected to be a new alternative heterogeneous acid catalyst for biodiesel production.