

# Catalytic Transformation of Triglycerides and Fatty Acids into Sustainable Biofuels

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The urgent need to combat climate change, driven by the accumulation of greenhouse gases (GHGs) in the atmosphere, and to enhance energy security has intensified the global shift from fossil fuels to renewable energy sources. Biofuels, derived from renewable biological resources, offer a viable solution by reducing carbon footprints and promoting energy independence, directly contributing to Sustainable Development Goal (SDG) 7 (Affordable and Clean Energy). Catalytic processes such as transesterification, esterification, catalytic cracking, hydrodeoxygenation, and deoxygenation is essential in converting these feedstocks into valuable green biofuels which include biodiesel, renewable diesel (also known as green diesel), and sustainable aviation fuel. These processes help to reduce the oxygen content of the feedstocks, thereby improving important fuel properties such as higher energy density, combustion efficiency, and long-term stability. As a result, the upgraded biofuels have better compatibility with existing infrastructure. Sustainable aviation fuel has become a vital solution for reducing carbon emissions in the aviation sector. It plays an important role in the global effort to achieve net-zero emissions by the year 2050. Among the various feedstocks available for sustainable aviation fuel production, *i.e.* vegetable oils, including refined oils, used cooking oils, and industrial by-products such as palm fatty acid distillate, provide a renewable and accessible resource. In summary, this lecture will examine catalytic transformation of triglycerides and fatty acids, with an emphasis on the production of renewable diesel and sustainable aviation fuel. It will also explore the potential of these technologies to contribute significantly to the decarbonization of the transportation industry.

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