

Sustainable Production of Biofuels

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Most of the energy used by the developed world is derived from fossil fuels, despite their environmental and economic challenges. Burning fossil fuels is the primary source of global warming and greenhouse gas emissions. Additionally, price instability and the limited reserves of petroleum resources make fossil fuels an unreliable energy source. Therefore, the search for alternative renewable and sustainable fuels has become essential.

Recently, biodiesel has emerged as a sustainable and competitive alternative to petroleum diesel fuel. It is a non-toxic and biodegradable fuel that offers sulphur-free and aromatic-free combustion. Waste cooking oil (WCO) is recognised as a significant feedstock for second-generation biodiesel production. However, the high free fatty acid (FFA) content in WCO often necessitates pre-treatment before processing. The biodiesel reaction under supercritical methanol conditions has proven to be a successful method for the direct conversion of WCO with relatively high FFA content.

As the world strives to meet the UN Sustainable Development Goals (SDGs), it is increasingly urgent for heavy transportation sectors like shipping and aviation to decarbonise in an economically feasible manner. In recent years, research has concentrated on converting free fatty acids (FFAs) in waste fish oil into fatty acid methyl esters (FAMEs), primarily through the transesterification reaction. Biodiesel produced from salmon waste offers an alternative raw material for sustainable energy production, meeting growing energy demands while minimising environmental impact. This presentation will highlight key scientific challenges associated with these concepts and demonstrate how research at the interface of innovative, greener, and sustainable processes contributes significantly to this field. General aspects will be illustrated with current laboratory research on sustainable biofuel production.