

Biological Feedstocks for Sustainable Aviation Fuel

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Abstract : Sustainable Aviation Fuel (SAF) has emerged as a critical solution for reducing the aviation sector's carbon footprint. Biological feedstocks, such as lignocellulosic biomass, microalgae, used cooking oil, and municipal solid waste, offer significant potential to replace fossil-based jet fuels with renewable alternatives. This review paper aims to critically examine the current landscape of biological feedstocks for SAF production, focusing on feedstock availability, conversion technologies, and environmental impacts. The paper evaluates the biochemical pathways employed in transforming these feedstocks into SAF, such as hydrothermal liquefaction, Fischer-Tropsch synthesis, and microbial fermentation, highlighting the advancements and challenges in each method. Additionally, the sustainability of biological feedstocks is analyzed with respect to lifecycle emissions, land use, and water consumption, emphasizing the need for region-specific strategies to maximize benefits. Special attention is given to the role of microbial consortia in optimizing feedstock degradation and conversion processes. The review concludes by discussing the scalability and economic viability of biological feedstock-based SAF, with a focus on policy frameworks and technological innovations that can facilitate widespread adoption. This comprehensive review underscores the pivotal role of biological feedstocks in achieving a decarbonized aviation sector and identifies future research directions for improving SAF production efficiency and sustainability.

Keywords : fuel diversity, biological feedstocks, SAF, aviation

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