Producing Petrol-quality Fuels from Biogenous Waste Fats by Catalytic Pyrolysis at Activated Carbon

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Pyrolytic-catalytic conversions define the scientific state-of-the-art for the utilisation of fats, oils and fatty acids of lower quality. The products are not methyl esters (biodiesel) of restricted acceptability for automotive use, but alkanes, olefins and aromatics, occurring in fossil gasoline, kerosene and diesel fuels.

While comparable processes usually apply expensive silica- or alumina-based catalysts, our approach relies on the catalytic potential of relatively inexpensive activated carbon, which is additionally easier to regenerate and immanently insensitive to coking. Processes following the so-called greasoline® concept are based on a catalytic gas-phase reaction at activated carbon, reaching temperatures of up to 600 °C (1,112 °F). Fats and oils are preheated, filtrated, vaporized and fed to the reactor. There they are catalytically decomposed and partially react with the activated carbon at ambient pressure. If needed, steam can be added in order to support the reaction. Finally, a product separation removes volatile by-products (optionally to be used for reactor heating) and inert gas (optionally to be recycled as carrier gas for the waste fats input). Glycerol, derived from the oils and fats, is converted to hydrocarbon gases like propene, which can be used for heating the reactor. First results indicate that even processing glycerol by-product of Biodiesel production is possible.

Experimental results in lab-scale revealed that mainly the kind of activated carbon, the reaction temperature and the residence time control the product yield and composition. While gasoline-fraction-optimized reaction modes led to liquid products containing more than 70 % of gasoline components (alkanes up to C11 and alkylated monocyclic aromatics), diesel-fraction-optimized ones produced liquid products containing 55 % of diesel components (alkanes from C12 on and polycyclic aromatics).

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