

Contribution to the Study of the Catalytic Process for the Conversion of Bioethanol to Olefins (C15–C18) and Sustainable Aviation Fuel (SAF) and/or Green Diesel

This study investigates catalytic pathways for converting bioethanol into long-chain α -olefins (C15–C18) and advanced biofuels, including Sustainable Aviation Fuel (SAF) and green diesel. Reaction systems were structured into two main groups: (i) direct ethanol conversion to light olefins, oxygenated intermediates, and fuel precursors, and (ii) oligomerization and chain-growth reactions involving C2–C6 alcohols and olefins to produce hydrocarbon fractions suitable for aviation and diesel applications.

Experimental findings suggest that, contrary to conventional literature, which relies primarily on ethylene as the key intermediate, butene plays a central role in the reaction network under optimized conditions. The use of mesoporous catalysts enabled efficient olefin production within the carbon number range associated with aviation kerosene, while operation at lower temperatures and pressures demonstrated potential for capital expenditure (CAPEX) reduction and improved process flexibility. Additionally, the results indicate that oligomerization reactions can proceed effectively using metal-free catalytic systems at relatively low temperatures. Increased butene concentration in the reaction effluent and higher operating pressures were found to favor oligomerization over isomerization, enhancing selectivity toward long-chain olefin formation.

These findings contribute to the development of cost-effective catalytic routes for producing drop-in renewable fuels from bioethanol, thereby advancing sustainable fuel technologies for the aviation and heavy-duty transport sectors.