

Advanced biphasic selective glycerol oxidation in a jet loop reactor using polyoxometalates

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Abstract

The selective oxidation of glycerol to formic acid is investigated using an innovative jet loop reactor (JLR) and compared with a traditional stirred tank reactor, to highlight the potential economic advantages of the JLR system. The product distribution (with formic acid being the main product) of both reactor setups is compared, with the JLR anticipated to achieve a significantly higher space-time yield.

By utilizing glycerol, a renewable by-product of biodiesel production, a promising approach for generating green formic acid from sustainable resources is introduced. Comprehensive studies on the kinetics of selective glycerol oxidation in the JLR will be shown, with an emphasis on assessing gas-liquid mass transfer characteristics, including the determination of the mass transfer coefficient and specific energy dissipation rates. The Hatta number will be determined to assess potential mass transfer limitations and the reactor's efficiency. Kinetic analyses will focus on determining reaction orders for both oxygen and glycerol. The anticipated activation energy for the reaction will be compared with typical values seen in catalyzed systems. Overall, the research aims to establish a robust foundation for sustainable formic acid production and identify key parameters necessary for scaling the process from laboratory to pilot plant settings.

