

# Ultrasonication: A Process Intensification Tool For Methyl Ester Synthesis: A Mini Review

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## ABSTRACT

Process intensification has been a promising tool for efficient energy usage, especially in the production of products that are considered energy sources, such as biodiesel. The very mechanism of ultrasound in aiding the reactions lies in the implosion of cavitation bubbles that generate hot regions with extremely high temperatures that reach as high as thousands of degree Celsius on a microsecond timescale. As biodiesel is emerging as an alternate green fuel or extender for fossil diesel that is apparent from the biodiesel mandates across the globe, sonochemistry technology is sought-after as a tool to produce biofuel in a much efficient way. Research and development in this technology is crucial to keep the biodiesel industry relevant by lowering the production cost, as the cost of production is seen as one of the major obstacles in biodiesel commercialization. In addition, by utilizing process intensification tools, the amount of catalyst and associated issues (abundant wastewater generation and treatment, process cycle time) can be reduced, in turn making the process much greener. Ultrasound not only accelerates the reaction rate but also assists in the miscibility of oil and methanol, thus decreasing the amount of catalyst needed for the reaction. While many articles have been issued on ultrasound-assisted biodiesel production, a comprehensive review on the very topic of ultrasound in biodiesel is somehow missing. This review intends to explore the use of ultrasound in transesterification and esterification reactions to produce methyl esters (biodiesel).

**KEYWORDS:** Biodiesel, Ultrasonic, Probe and bath sonicator, Cavitation, Transesterification, Environmental remediation

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