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(57) Abstract :

ABSTRACT: Title: A Method for Producing High-Purity Biodiesel from Neem Oil Using Laser Pre-Treatment The present disclosure proposes a method for producing high-purity biodiesel from neem oil using laser pre-treatment and a CaO nanocatalyst to achieve enhanced efficiency and yield. The method involves pretreating neem oil with laser irradiation to enhance the efficiency of the transesterification process, followed by reacting the pretreated oil with methanol in the presence of a CaO nanocatalyst. The process variables, including reaction temperature, time, catalyst loading, and oil-methanol molar ratio, are systematically optimized to maximize biodiesel yield. Additionally, the method addresses the challenges of catalyst deactivation and fouling by enabling catalyst regeneration for multiple cycles, thereby improving the overall efficiency and sustainability of biodiesel production. The method also demonstrates that neem oil exhibits exceptional water tolerance in the transesterification process, further enhancing its suitability as a biodiesel feedstock.

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