

**Mechanochemical Synthesis and Production Scale-up of Calcium Diglyceroxide (CaDG)
as a Heterogeneous Catalyst for Sustainable Biodiesel Production**

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The transesterification of triglycerides into fatty acid methyl esters (FAME) is central to biodiesel production, but typically involves energy-intensive downstream processing, including water-based purification and rectification. To address this, Deasyl investigated calcium diglyceroxide (CaDG) as an alternative heterogeneous catalyst, synthesized from calcium oxide and crude glycerol, the co-product of FAME production itself.

As a result, a new synthesis route based on mechanochemistry was developed to produce CaDG in accordance with Green Chemistry principles. Thermal and kinetic studies, supported by modelling, provided deeper insight into the formation mechanism of the catalyst and guided the optimization of post-treatment conditions. Based on these elements, catalyst production was successfully scaled from lab to multi-kilogram pilot quantities, confirming its robustness and suitability for industrial application.

Finally, the catalytic performance of CaDG for FAME production was validated at pilot scale, demonstrating efficiency and stability under realistic processing conditions. These findings position CaDG as a promising candidate for more sustainable and simplified FAME production.