Mechanochemical Synthesis and Production Scale-up for Glycerol Valorisation Products

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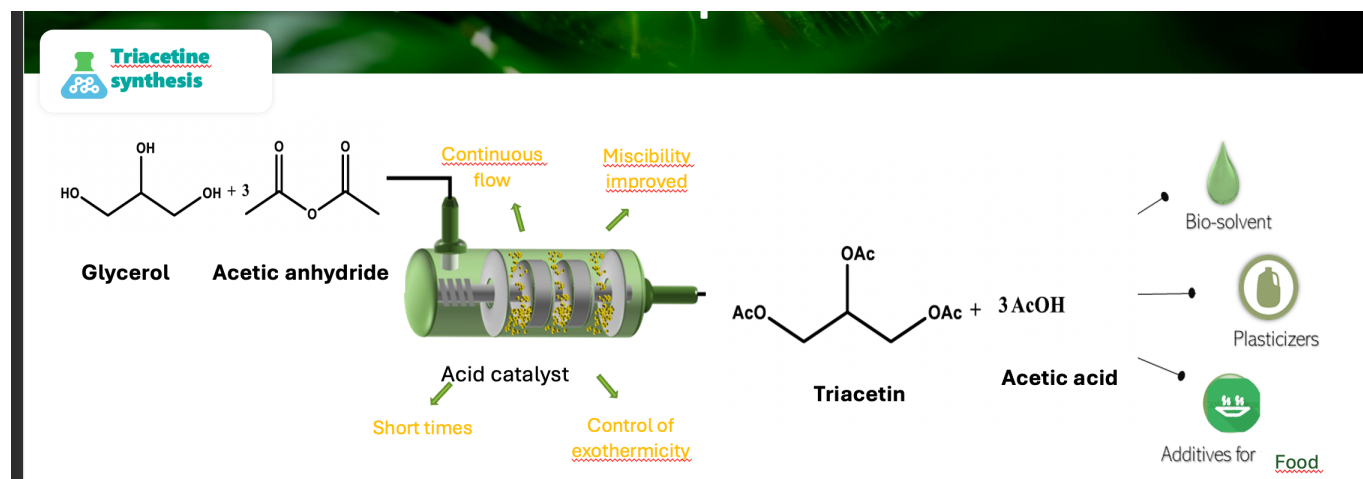Deasyl SA, Chemin du Pont-de-Centenarie 100, 1228 Plan-les-Ouates, Switzerland
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Glycerol is one of the most abundant and under-valued by-products of biodiesel manufacturing. Its transformation into higher-value derivatives such as **triacetin** and **solketal** represents a key opportunity to improve the circularity and economic performance of bio-based industries. However, conventional routes generally rely on strong acids, elevated temperatures or multi-step purification sequences that limit their environmental and industrial viability.

In this contribution, we present two intensified processes developed at Deasyl for the valorisation of crude glycerol using mechanochemical activation, continuous-flow reactor design, and solvent-free conditions.

The mechanochemical acetylation route enables the continuous production of triacetin at room temperature, with short residence times and direct processing of crude feedstock. Similarly, the continuous mechanochemical route for solketal formation achieves high selectivity under mild conditions and incorporates a downstream purification strategy adaptable to industrial operation.

A central outcome of this work is the demonstration that these processes are fully scalable to industrial-level throughputs, thanks to the inherent energy efficiency, compact reactor design, and the elimination of solvents and intensive downstream steps. These results highlight the strong potential of mechanochemistry as a transformative technology for industrial-scale glycerol valorisation, enabling more sustainable, high-performance production routes for bio-based chemicals.

References

[1] Remi Nguyen, Samy Halloumi, Irene Malpartida, Christophe Len, *Org. Process Res. Dev.*, **2024**, 29, 769−777

[2] Remi Nguyen, Samy Halloumi, Irene Malpartida, Christophe Len, *J Flow Chem,* 2025, 15, 1–9.