

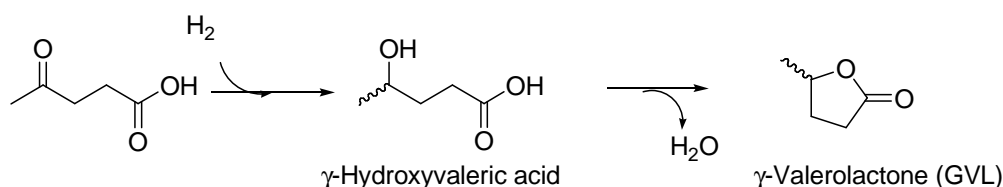
THE CONVERSION OF PLATFORM CHEMICALS FROM BIOMASS: MULTIPHASE HYDROGENATION/DEHYDRATION OF LEVULINIC ACID TO γ -VALEROLACTONE (GVL)

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Levulinic acid (LA) can be cheaply produced from lignocellulosic materials via biological or chemical conversions, and thanks to its dual functionality, LA is a precursor for a variety of useful intermediates in both pharma and food sectors.¹ Not by chance, the US Department of Energy has recently classified LA among the twelve most attractive biobased-chemicals.²

In this study, an innovative method is reported for the catalytic hydrogenation/dehydration of levulinic acid to γ -valerolactone (GVL). The reaction has been investigated under multiphase conditions, by using a 5% Ru/C catalyst, gaseous H₂, and a liquid triphase system made by an hydrocarbon (isooctane), water and a catalyst-philic ionic liquid (Scheme 1).



Scheme 1

Notwithstanding its complexity, operating at 100°C and 35atm of H₂, this arrangement not only allows substantially quantitative yields of GVL, but it greatly improves the separation of the product and the recycle of the catalyst. Water acts as a solvent for both the substrate (LA) and the product (GVL); while, the combination of the ionic liquid [especially, trioctylmethylphosphonium bis(trifluoromethane)sulfonimide] which strongly adsorbs over the catalytic (C) support, and isooctane allow a perfect confinement of Ru/C between the hydrocarbon-water phases.

¹ (a)Bozell, J. J.; Moens, L.; Elliott, D.C.; Wang, Y.; Neuenschwander, G. G.; Fitzpatrick, S. W.; Bilski, R. J. and Jarnefeld, J. L.; Resources, Conservation and Recycling, **2000**, 28, 227–239; (b) Horvath, I. T.; Mehdi, H.; Fabos, V.; Boda, L. and Mika, T. L.; Green Chem., **2008**, 10, 238-242.

² Werpy, T. and Petersen, G.; In *Top Value Added Chemicals From Biomass*, the Pacific Northwest National Laboratory (PNNL) and the National Renewable Energy Laboratory (NREL), U.S. Department of Energy, **2004**