Solvent free synthesis of γ-valerolactone and its use as a green reaction media for catalysis

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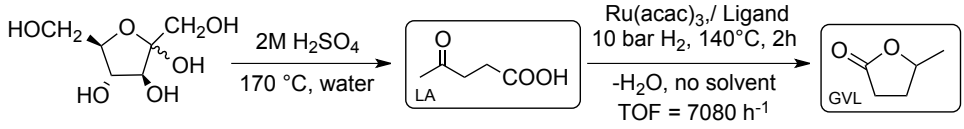
Due to its outstanding physical and chemical properties, γ-valerolactone (GVL) can be considered as a sustainable liquid and used for the production of both energy and carbon-based chemicals [1]. Since the most effective protocol to manufacture GVL is the selective hydrogenation of levulinic acid (LA), we have developed a recyclable sulfonated-tertiary and bidentate phosphines-modified Ru catalyst systems that can quantitatively convert LA, which was obtained by dehydration of fructose to GVL under solvent and additive free conditions (Scheme 1) [2].



Scheme 1

Recently it was also revelaed, that GVL and its ionic liquid (IL) derivatives can be used as a "green" reaction media for catalytic transformations [3]. We have demonstrated the successful utilization of GVL based ILs as catalyst phase for selective hydrogenation of olefins having various functional groups in the presence of $[Rh(cod)_2][BF_4]/RP(C_6H_4\text{-}m\text{-}SO_3Na)_2$ (R = Me, Pr, Bu, Cp) catalyst [3b].

Our contribution will show the catalyst design and development for production of GVL including synthesis of its optically active form. The characterization (vapor pressure, viscosity, thermal stability) and application of GVL based ILs as alternative solvents for catalytic transformation *e.g.* hydrogenation and transfer hydrogenation, hydroformylation, metathesis *etc* will be presented as well.

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[2] (a) Tukacs, J. M.; Király, D.; Strádi, A.; Novodárszki, G.; Eke, Z.; Dibó, G.; Kégl, T.; Mika, L. T. *Green Chem*., **2012**, *14*.; (b) Szabolcs, Á.; Molnár, M.; Dibó, G.; Kégl, T.; Mika, L. T. *Green Chem*., **2013**, *15,* 439

[3] (a) Qi, L.; Mui, Y.F.; Lo, S.W.; Lui, M.Y.; Akien, G.R.; Horváth, I.T. *ACS Catal.* **2014**, *4*, 1470.; (b) Strádi A., Molnár M., Óvári M., Frank U. R., Dibó G., Mika L. T. *Green Chem*. **2013**, *15*, 1857.