Alternative technologies for the selective conversion of bio-based feedstocks to specialty chemicals

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With the growing concerns of our society about climate change, a strong political impulsion has been given to the defossilization of our industry. In this context, the production of chemicals from biomass waste has become of particular interest. Biomass waste is mainly composed of sugars. The chemical activation of sugars generally requires heat which unfortunately lead to uncontrolled degradation reaction and the formation of side products. In terms of selectivity issue, being able to activate sugars at low temperature is a prerequisite, but it remains a difficult scientific question.
The massive electrification of our society now opens rooms for the development of alternatives technologies, in particular to replace the tradition "chemical" by a "physical" activation. We will illustrate this possibility by discussing the mecanocatalytic synthesis of biosurfactants directly from cellulosic biomass.[1]. The impact of water and minerals present in biomass on the mechanocatalytic process efficiency will be discussed as well as a life cycle assessment to shed light on the contribution of this technology as compared to the current industrial process. Turning now to reactions in water, an essential solvent for biomass, we will highlight the contribution of ultrasound for the catalyst free biomass processing. We will show that high frequency ultrasound is capable of generating •OH radicals (homolytic dissociation of water inside cavitation bubbles), and thus to initiate chemical reactions at a nearly room temperature with sugars. Transposition of this technology for the activation and conversion of NH_3 (future H_2 carrier) will be also discussed, particularly for the metal free hydrogenation of biobased alkenes in water.[2, 3]

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[3] A. Humblot, T. Chave, P. N. Amaniampong, S. Streiff, F. Jérôme, *Angew. Chem. Int. Ed*., **2022**, *61* (51), e202212719