



GREEN DESIGN OF BIO-BASED PLATFORM CHEMICALS VIA ORGANIC CARBONATE

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The transition from fossil-based chemistry to sustainable manufacturing requires the development of synthetic methodologies that integrate renewable feedstocks, environmentally benign reagents, and resource-efficient processes. Bio-based platform chemicals derived from lignocellulosic biomass, including furanic compounds, isosorbide, levulinic acid derivatives, sugar alcohols, and other oxygenated building blocks, represent key intermediates to produce next-generation polymers, fine chemicals, pharmaceuticals, and functional materials. However, their efficient transformation often relies on hazardous reagents, toxic solvents, and multistep synthetic protocols that diminish the overall sustainability of the process.

Within this context, our research focuses on advancing the green synthesis of bio-based platform chemicals by exploiting organic carbonates as green and versatile media and reagents. Dialkyl carbonates, particularly dimethyl carbonate (DMC), have been successfully employed as environmentally benign reagents, solvents, and reaction media for the synthesis and selective transformation of biomass-derived compounds, including *D*-sorbitol, *D*-fructose, galactaric acid, and related renewable feedstocks. These organic carbonates offer a safer alternative to conventional halogenated reagents while enabling highly selective, chlorine-free transformations under mild reaction conditions.

The synthetic methodologies developed are designed not only to utilize renewable feedstocks and safer reagents but also to minimize waste generation, reduce energy consumption, simplify product isolation, and improve overall process efficiency. Particular emphasis is placed on the preparation of high-value platform chemicals and functional intermediates with potential applications in bio-based polymers, green solvents, pharmaceuticals, and specialty chemicals. The greenness of the developed processes was evaluated using established green chemistry metrics that provide quantitative tools for reaction optimization and facilitating future scale-up and industrial implementation.