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DIALKYL CARBONATE CHEMISTRY: EXPLORING NEW GREEN, CHLORINE-FREE SYNTHETIC APPROACHES

SPECIAL SYMPOSIA
5. Chemistry Addressing the UN-17 Sustainable Development Goals

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Abstract

Dialkyl carbonates are green solvents and reagents (DACs) extensively investigated as possible alternatives to chlorine reagents and solvents.[1] Specific areas where Green, chlorine-free synthetic approaches via DAC chemistry have been exploited include:

Renewables upgrade: Substitution of petroleum-based compounds with renewable substances has been a focal point in recent research. The US Department of Energy (DOE) has published a list of target molecules considered of special interest for biorefinery development.[2] Among them D-sorbitol, and HMF derivatives occupies a top position in the list as they encompass all of the desired criteria for a bio-based platform compound. In particular, chlorine-free upgrading of D-sorbitol, isosorbide and HMF with DACs has led to several industrially relevant product.[2]

Heterocycles: DACs chemistry has been proved efficient in the preparation of numerous 5- and 6-membered heterocycles including: furan systems, pyrrolidines, indolines, isoindolines, 1,4-dioxanes, piperidines and cyclic carbamates. In these reactions, the selected DAC acts as sacrificial molecule instead of Chlorine-based compounds.[3] Mustard carbonates:

Mustard carbonate: Carbonate analogues of toxic mustard gases - are a new class of compounds, easily synthesized via DAC chemistry retaining the reactivity of mustard gases, but that are not toxic for the operators or the environment. Their reactivity as novel, green electrophiles and their possible potential application as green reagents have been investigated; applications include synthesis of heterocycles via ring expansion and macromolecules preparation.[4]

Research conducted in the abovemention areas indicate that DACs can be used to develop a beyond chlorine chemistry with high efficiency and selectivity.

Bibliography

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