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Conceptually novel Catalytic Approaches towards Larger-Ring Cyclic Carbonates

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PURPOSE OF THE ABSTRACT

The utilization of carbon dioxide as a renewable carbon source to prepare valuable chemicals such as organic carbonates has gained increasing attention over the last decade.[1] However, methods to generate six-membered heterocycles are scarce and often rely on stoichiometric approaches.[2] In this respect, we have developed a kinetically controlled cascade process offering convenient access to six-membered cyclic carbonates from ?-epoxy alcohols and CO2. In this transformation, a thermodynamically disfavored 6-membered carbonate intermediate can be trapped by a kinetically controlled esterification step, thus providing new impetus to access larger-ring carbonate products (pathway A). [3] Unfortunately, the presence of an ester group also limits the application of these compounds in ring-opening polymerization (ROP). To solve this problem, we designed more rigid ?-epoxy alcohols which reduce the potential of the pendent OH group to ring-open the initially formed carbonate ring. Through this alternative strategy, [4] we successfully developed a direct route towards 6-membered cyclic carbonates via a one-step catalytic process, and explored the reactivity of these bicyclic heterocycles in ROP (pathway B).

FIGURES

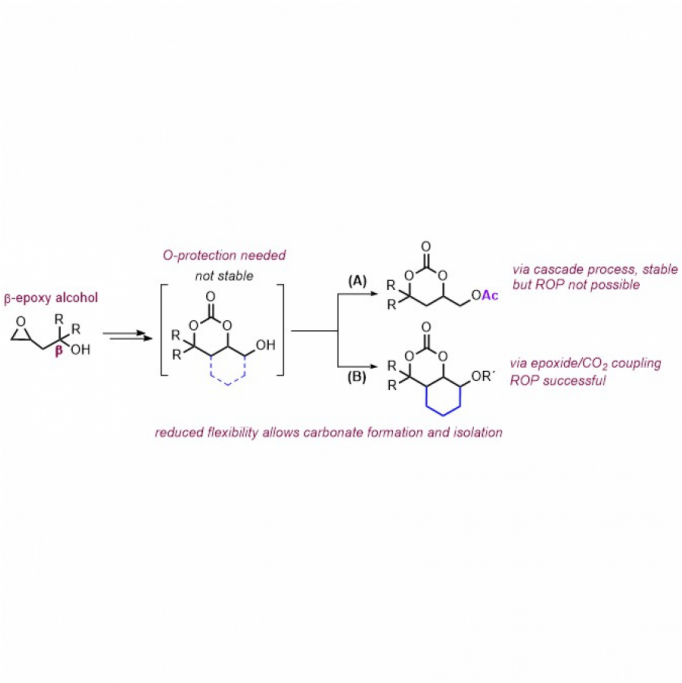

FIGURE 1

Conceptually novel Catalytic Approaches towards Larger-Ring Cyclic Carbonates

Figure 1

FIGURE 2

KEYWORDS

6-membered cyclic carbonates | carbon dioxide | epoxy alcohols | polymer

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