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Thermomorphic polyethylene-supported organocatalysts for the synthesis of organic carbonates

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PURPOSE OF THE ABSTRACT

Organic cyclic carbonates are currently the subject of intense research due to their interesting applications in polymers, electrolytes, building-blocks and solvents.[1] One of the most direct ways to prepare organic cyclic carbonates is through the reaction of epoxides and CO₂, giving the desired species with 100% atom economy. A lot of catalytic systems have been reported for this reaction, including homogeneous or heterogeneous, organic or organometallic species, which all have inherent advantages and drawbacks.[2]

In this context, we have developed an original thermomorphic polyethylene-supported organocatalyst. The thermomorphic support allows the catalyst to be homogeneous in the reaction mixture at high temperature (~90-100°C) and to precipitate at lower temperature, thus enabling easy separation by filtration. This thermomorphic property allows the organocatalyst to combine the advantages of both homogeneous (high catalytic activity, low loading) and heterogeneous (easy purification, recyclability) catalysis.

This innovative catalyst has been successfully applied to the preparation of carbonates from epoxides and CO₂. [3] Epoxidized fatty derivatives, including a rapeseed oil, have also been used to prepare fatty carbonates, that are useful for the preparation of non-isocyanate polyurethanes (NIPU). [4] Both studies feature recyclability tests demonstrating the interest of the thermomorphic catalyst.

More recently, we have developed a new catalytic access to vinylene carbonates through an organocatalyzed reaction of benzoin and acyloins using diphenyl carbonate as a carbonyl source in neat condition. [5] The thermomorphic organocatalyst has been used and recycled to prepare up to 33 g of product, showing its interest on the preparative scale.

FIGURES

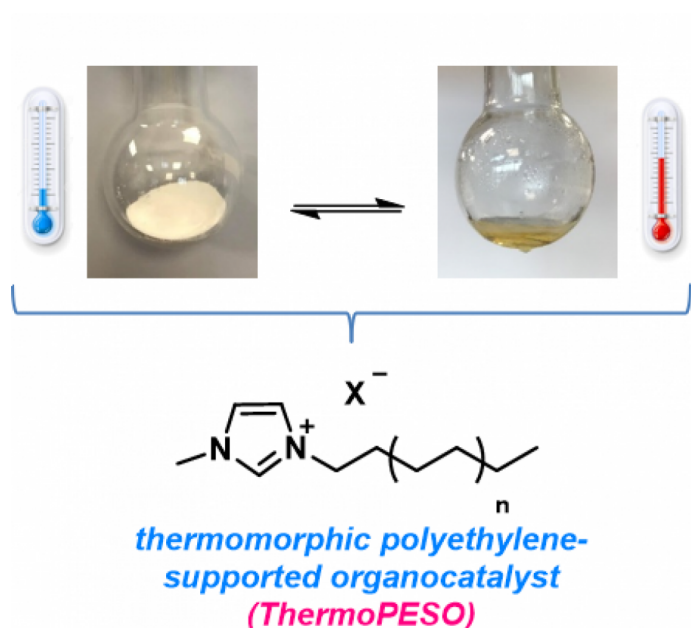


FIGURE 1

Figure 1

Thermomorphing polyethylene-supported organocatalysts (ThermoPESO)

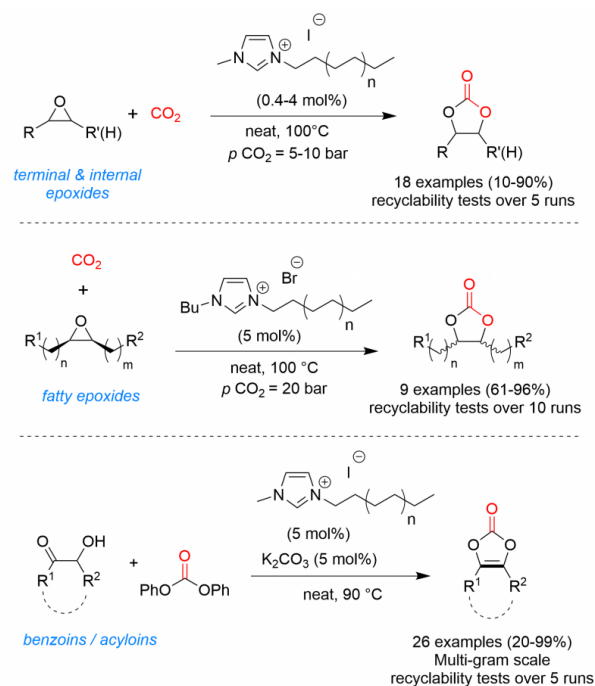


FIGURE 2

Figure 2

Applications of ThermoPESO to the synthesis of organic carbonates

KEYWORDS

Organic carbonates | Thermomorphing polyethylene | Organocatalysis | Carbon dioxide

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