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ITACONIC ACID AS RENEWABLE BUILDING BLOCK FOR UV-CURING POLYESTERS

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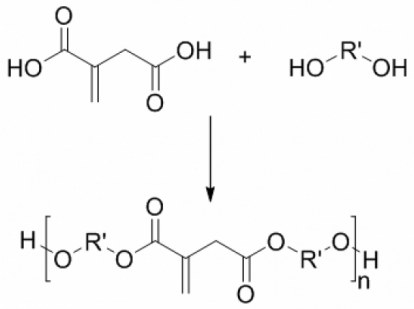
PURPOSE OF THE ABSTRACT

Over the last years itaconic acid has drawn considerable attention as novel and renewable building block for bio-based polymers. It has been used as (co-)monomer in radical polymerization reactions to obtain polyitaconates with different fields of application.[1] However, itaconic acid can also be used as monomer for unsaturated polyesters (figure 1).[2] Due to the higher reactivity compared to polyesters derived from maleic acid, these materials can also be used in UV-curing applications and have the potential to be a renewable alternative to polyester acrylates. In addition, by using other bio-based building blocks it is possible to obtain polymers of this type that are completely derived from renewable resources.

Herein, the synthesis and properties of novel polyester itaconates will be reported. Furthermore, the challenges associated with the polycondensation process compared to conventional polyesters will be discussed. This is of particular interest as undesired side-reactions can lead to crosslinking and gelation, which is not observed with other polyesters. It is shown that the choice of building blocks, as well as catalyst has a major influence on the outcome of the polycondensation process (figure 2).[3]
In addition, the polyester itaconates were examined as binder resins for different UV-curing applications, such as printing inks,[4] wood coatings, and materials for additive manufacturing. The results suggest that these bio-based resins can be an alternative to conventional polyester acrylates. These finding are very intriguing, as itaconic acid usually suffers from lower reactivity towards UV-induced crosslinking in comparison to acrylic acid. Furthermore, the properties of the UV-cured materials can compete with standard materials.

FIGURES



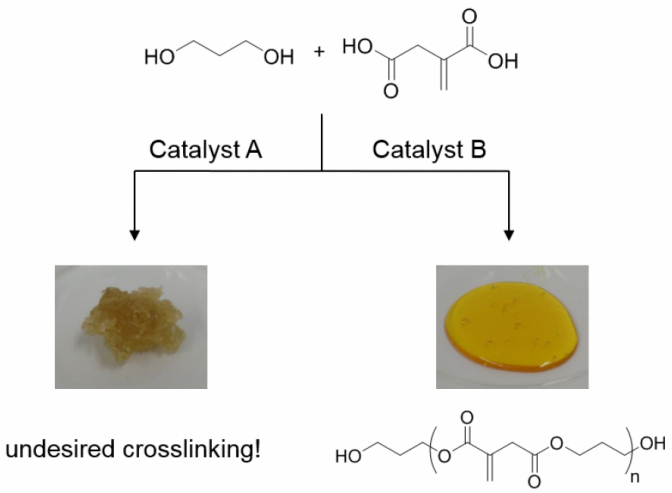


FIGURE 1

Figure 1

Bio-based polyester itacoinate

FIGURE 2

Figure 2

Undesired crosslinking of polyester itaconates.

KEYWORDS

itaconic acid | UV-curing materials | bio-based polymers | polyester resin

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