ISGC 2022

N°109 / OC
TOPIC(s) : Polymers or composites / Biomass conversion

Biobased Catalyst-free Vitrimers: From Vineyards To Reprocessable Networks

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PURPOSE OF THE ABSTRACT

Vitrimers are a class of polymers bridging the gap between resistant crosslinked thermosets and recyclable linear thermoplastics.[1] The first vitrimer described by the team of Leibler in 2011[2] is a polyester network requiring relatively large catalyst loadings to be reshaped. This feature raises concerns about catalyst potentially leaching out of the materials and accelerated ageing upon reprocessing cycles. Recently, strategies such as activation by inductive effects or neighboring group participation[3-6] were implemented on exchangeable bonds in such materials allowing to promote exchange reaction and produce reshapable materials which do not require catalysts.

Hence, ?-difluoro esters proved to activate transesterification thanks to fluorine exceptional properties, in particular its very high electronegativity.[7,8] This feature implemented in polyester vitrimers permitted to synthesize reshapable catalyst-free highly crosslinked networks. Moreover, this principle initially designed on petrosourced monomers has been successfully adapted to resveratrol, a biobased polyphenol found in particular in grapes. The material presented here is fully bio-based, catalyst-free, durable and recyclable.

FIGURES

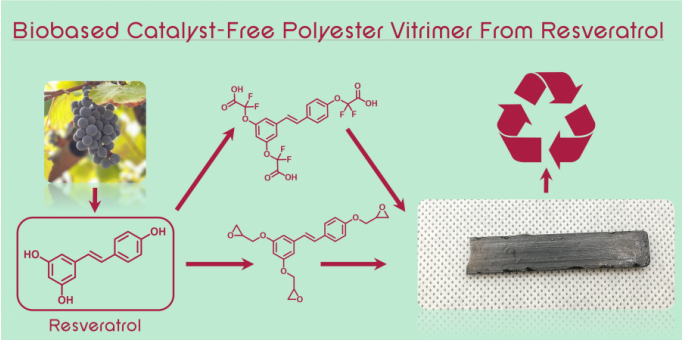

FIGURE 1

Summary of fully-resveratrol catalyst-free vitrimer life cycle

Resveratrol is natural polyphenol extracted from grapes. It was functionalized to give a trifunctional epoxy on one side a,d a trifunctional alpha-difluoro acid on the other. Both monomers were mixed to obtain a thermoset, which can be reshaped by hot pre

FIGURE 2

KEYWORDS

vitrimer | biobased | recycling | resveratrol

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