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Engineering of fatty acid methyl esters towards bio-based polymers with original topologies

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PURPOSE OF THE ABSTRACT

In this study, vegetable oils were used as a platform for the design of sustainable polyesters exhibiting a hyperbranched architecture. For that purpose, the approach by polycondensation of ABn-type monomers (n ? 2) was favored. Plant oils and/or fatty acid methyl esters were chemically modified to synthesize multifunctional precursors featuring ester (A) and alcohol moieties (B). Simple, safe and efficient chemical transformations were considered to provide industrial perspectives to this work. Two main platforms of ABn-type monomers were developed by (1) acid hydrolysis of epoxidized vegetable oils and (2) thiol- ene/metathesis coupling reactions. The subsequent polycondensation of these oily-derived monomers, performed in bulk, gave access to novel renewable hyperbranched polyesters. The branching density as well as the thermo-mechanical properties of these materials were adjusted by designing and selecting the chemical structure of the fatty acid-based monomers. Finally, the post-functionalization of these hyperbranched polyesters with the aim at tuning their properties opened the scope of their applications, from commodity plastics to advanced materials.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

hyperbranched polymers | vegetable oils | fatty acid methyl esters | polyesters

BIBLIOGRAPHY

Testud et. al. Green Chem 2016 (accepted)