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Reactivity Study of Multi-Functional Monomers for the Development of Water-Dispersible Polyesters

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PURPOSE OF THE ABSTRACT

The polymer class of polyesters has widely been investigated for more than a century and still attracts the interest of today's scientific community due to its great versatility of suitable monomers and resulting products. More recently, the focus of research has shifted towards bio-based monomers, bio-degradable products and more environmentally friendly polycondensation processes, trying to realize the principles of green chemistry [1]. Especially aliphatic building blocks for polyester synthesis are already produced from biomass feedstock, replacing their fossil-based counterparts in well-established products [2].

Next to conventional bio-based monomers, multi-functional hydroxycarboxylic acids were investigated which significantly alter the polymer properties such as increasing water-dispersibility. However, monomers such as tartaric and citric acid are not stable at conventional reaction temperatures and polyesters are prone to crosslinking if more than two functional groups take part in the condensation reaction. To tackle these difficulties, reactivities of different comonomers were investigated via NMR methods (Figure 1) and MALDI mass spectrometry to systematically tune the reaction process for successful incorporation of the multi-functional monomers.

FIGURES

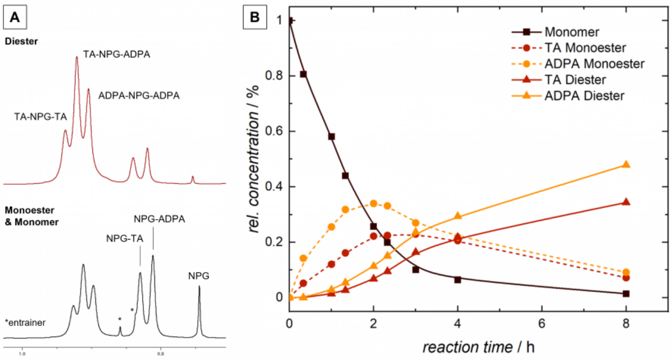

FIGURE 1

Figure 1:

A) Detail of H NMR spectra showing peak splitting of neopentyl glycol (NPG) methyl peaks due to reaction with tartaric acid (TA) and adipic acid (ADPA). B) The formation of mono- and diesters of different kinds shows the higher reactivity of adipic acid.

FIGURE 2

KEYWORDS

water-dispersible polyester | monomer reactivity | NMR

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