Plant Oils as Renewable Resources in Polymer Science

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We recently showed that different chain length *α,ω*-diester monomers can be obtained from plant oil derived fatty acid esters or fatty alcohols *via* olefin cross-metathesis with methyl acrylate taking advantage of natures "synthetic pool" of fatty acids with different chain lengths and positions of double bonds.[1,2] Similarly, we could show that their cross-metathesis with allyl chloride allows for the synthesis of *α,ω*-difunctional compounds.[3] Therefore, this strategy offers the possibility to introduce a variety of functional groups to the *ω*-position of fatty acid derivatives, thus providing valuable starting materials for a variety of polyesters and polyamides. Moreover, acyclic diene metathesis (ADMET),[4] can be used to directly obtain macromolecules from such starting materials. Investigations of the ADMET polymerization of undecylenyl undecenoate showed that it is possible to efficiently control the molecular weight of these materials and to prepare telechelics as well as ABA triblock copolymers *via* the application of mono-functional chain-stoppers.[5] Furthermore, tri-functional monomers in combination with chain stoppers allow for the synthesis of hyperbranched polymer architectures with functional groups in their periphery in a single reaction step.[6] During these ADMET polymerizations we observed more or less pronounced olefin isomerization side reactions, as already known for some metathesis catalysts.[7] Therefore, we recently developed a strategy to monitor and quantify these side reactions during ADMET polymerizations and were able to correlate their amount to the applied catalyst as well as reaction conditions.[8]

References:

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