New Monomers and Polymers from Plant Oils via Thiol-ene Additions

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We recently reported on the synthesis of different chain length \(\alpha,\omega\)-diester monomers 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.\(^{[1,2,3]}\) Similarly, we could show that their cross-metathesis with allyl chloride allows for the synthesis of \(\alpha,\omega\)-difunctional compounds.\(^{[3]}\) Therefore, this strategy offers the possibility to introduce a variety of functional groups to the \(\omega\)-position of fatty acid derivatives, thus providing valuable starting materials for a variety of polyesters and polyamides.

Within this contribution, a complementary approach towards renewable monomers and polymers utilizing thiol-ene click chemistry will be introduced and discussed.\(^{[5]}\) Also this approach takes advantage of the inherent double bond functionality of fatty acids and their derivatives and allows introducing a large variety of functional groups to fatty compounds. For instance, the castor oil derived methyl 10-undecenoate\(^{[6]}\) was used to prepare a set of monomers with high yields in an environmentally friendly reaction (no solvent, low E-factors). These monomers were subsequently polymerized to yield renewable polyesters, the material properties of which will be discussed within this contribution. Moreover, thiol-ene click chemistry was used to polymerize fatty acid derived monomers and renewable plant oil derived dendrimers were prepared via this approach.

In summary, thiol-ene addition reactions are as versatile as olefin metathesis for the introduction of functional groups in an efficient and environmentally friendly manner in the field of oleochemistry.\(^{[7]}\)

References: