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Increasing the solubility range of polyesters by tuning their microstructure with comonomers

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ω-Pentadecalactone (PDL) is a biobased 16-membered macrolactone that can be derived from renewable resources. Its regular structure makes it highly crystalline and thus interesting as a biobased replacement for linear low density polyethylene. However, its solubility is very limited (chloroform) which hinders the use of PDL polymers in other applications requiring large solubility range. Copolymerization with a branched lactone is one way to reduce crystallinity because it is expected to disrupt the co-polyesters' microstructure. Nevertheless, it has been shown that the microstructure of PDL-based co-polyesters varies depending on the comonomer structure. A block copolyester is obtained with branched lactones while a random structure is obtained with unsubstituted lactones of various size. It was attempted to break the crystallinity of PDL-based copolyesters with a view of increasing their solubility range. Therefore, PDL was copolymerized with the branched and biobased δ-undecalactone (UDL), whose homopolymer is amorphous. In order to assess the microstructure (random or block-like), monomer distribution within the PDL-co-UDL polyesters was assessed by 13C NMR. It was observed that crystallinity of the copolyesters was decreased but not suppressed as measured by DSC, partially because they did not display a fully random monomer order. Hansen solubility parameter determination however showed that the solubility range of the copolyesters was improved compared to PDL homopolymers.

Biography

Katrien Bernaerts graduated as a Licentiate (Master) in Chemistry from Ghent University (Belgium) in 2000. From 2000-2005 during her PhD in polymer chemistry in the group of Prof. Du Prez at Ghent University (Belgium) she performed on the synthesis and evaluation of stimuli (pH and temperature) responsive copolymer architectures by combination of different polymerization techniques. After PhD, she spent 7 years in industry, doing research in the field of coatings and fibers. Since 2012, she started as Assistant Professor Polymer Chemistry at Maastricht University. Her main research interest is the synthesis of renewable, functional (co)polymers with a variety of architectures via different chemistries and the study of their structure-property relationships in several fields of application e.g. stimuli-responsive polymers, organic coatings, fibers, organic membranes, engineering plastics and biomedical applications.

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