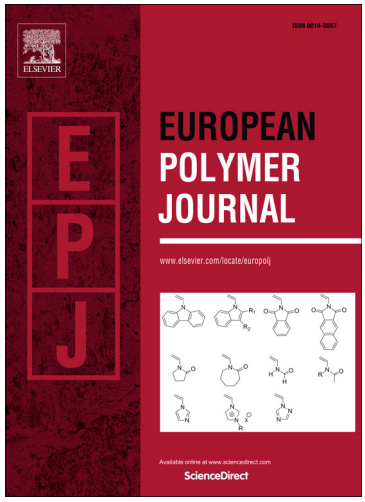
Accepted Manuscript



Post-functionalization of fully biobased poly(limonene carbonate)s: Synthesis, characterization and coating evaluation

Chunliang Li, Stefan van Berkel, Rafaël J. Sablong, Cor E. Koning

PII: S0014-3057(16)30895-3
DOI: http://dx.doi.org/10.1016/j.eurpolymj.2016.10.053
Reference: EPJ 7590

To appear in: *European Polymer Journal*

Received Date: 10 August 2016
Revised Date: 6 October 2016
Accepted Date: 31 October 2016

Please cite this article as: Li, C., van Berkel, S., Sablong, R.J., Koning, C.E., Post-functionalization of fully biobased poly(limonene carbonate)s: Synthesis, characterization and coating evaluation, *European Polymer Journal* (2016), doi: http://dx.doi.org/10.1016/j.eurpolymj.2016.10.053

Post-functionalization of fully biobased poly(limonene carbonate)s: synthesis, characterization and coating evaluation

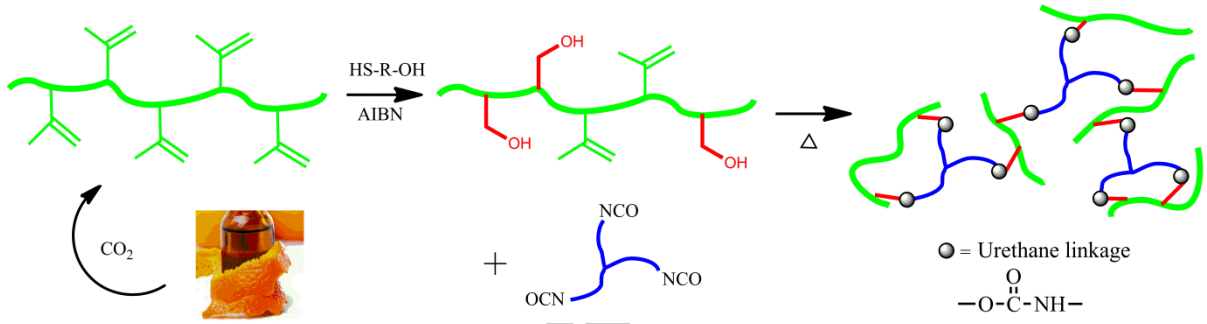
Chunliang Li[1], Stefan van Berkel[2], Rafaël J. Sablong[1,2*], Cor E. Koning[1,3]

[1]Laboratory of Physical Chemistry, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands

[2]Polymer Technology Group Eindhoven B.V. (PTG/e), P.O. Box 6284, 5600 HG Eindhoven, The Netherlands

[3]DSM Coating Resins, Ceintuurbaan 5, 8022 AW Zwolle, The Netherlands

* Corresponding author: Tel.: +31 40 247 5197. E-mail addresses: rafael.sablong@ptgeindhoven.nl



Abstract:

Fully biobased poly(limonene carbonate)s (PLCs) have been prepared by copolymerization of limonene oxide with CO_2, using a β-diiminate zinc-bis(trimethylsilyl)amido complex as the polymerization catalyst, and subsequent transcarbonation reactions using 1,5,7-triazabicyclo-[4.4.0]dec-5-ene (TBD) as the catalyst, combined with 1,10-decanediol as the transcarbonation agent. Quantitative partial post-modification of these polycarbonates was fulfilled via thiol-ene chemistry using two mercaptoalcohols with different chain lengths, viz. 2-mercaptoethanol and 6-mercaptohexanol. The thermal properties and hydroxyl values (OHVs) of the resulting hydroxyl PLCs were modulated by controlling the type and amount of incorporated thioether species. The curing kinetics of these PLCs with blocked/non-blocked multifunctional isocyanates was studied by ATR-FTIR followed by the solvent casting and curing under the optimal conditions. The good acetone resistance and high transparency and hardness of the coatings demonstrated that the fully bio-based PLCs with adequate molecular weights and OHVs are promising resins for coating applications .

Keywords:

Biobased polycarbonate, thiol-ene, hydroxyl, crosslinking, glass transition temperature, coating.