

From waste tires to new recyclable polyurethane network

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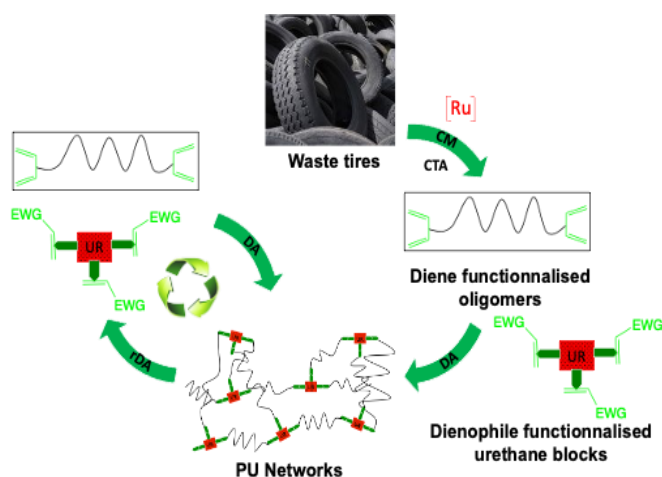
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Abstract :

Since the annual rubber production reaches 26 million tons (2016), the chemical recycling of rubber wastes is an important societal challenge. Among the few known methods of degradation of elastomers, Ruthenium catalyzed Cross-Metathesis (Ru-CM) degradation is of particular interest and allows to simultaneously decrease the molar mass of the starting polymer and end- functionalize the obtained oligomers/polymers by the use of difunctionalized alkenes as Chain Transfer Agents (CTAs).¹⁻⁴ Recently, we successfully applied the metathetic depolymerization process on waste truck tires (which contain almost 60% of polydienes (polyisoprene and polybutadiene)) to synthesize telechelic elastomers with various functional groups (ester, alcohol, phosphonate...).⁵ The aim of this project is to explore for the first time, the Ru-CM reaction to recover Diels-Alder (DA) adducts elastically active chains via the use of diene fonctionalized CTA. The Ru-CM reaction, leading to telechelic elastomers, will be studied on polyisoprene and then extended to the chemical valorization of waste tire. Finally, the functionalized soft segments, will be involved for the design of reversible cross-linked PU networks using the reversible diene-maleimide DA reaction. A particular interest will be paid in studying the impact of the nature of the diene adduct and the influence of the crosslink density and the flexible block length on the thermomechanical properties of the networks and their recyclability.



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