DESIGN OF POLYCARBONATE COATINGS FROM CO2-BASED MONOMERS BY SOLVENT FREE POLYMERIZATION AND EVALUATION OF THEIR RECYCLABILITY

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Polycarbonates (PCs) are a family of thermoplastics employed in various rigid plastics applications, such as construction materials or electronic devices. Nowadays, the most conventional way to produce PCs is the polycondensation of diols and phosgene/phosgene derivatives. The toxicity of the reagents (phosgene, Bisphenol A) and the production of undesirable condensation products to eliminate make this process rather unsustainable.

This research project focuses on developing sustainable circular polycarbonate-based coatings. It is based on highly reactive CO_2-sourced cyclic carbonates, previously developed in *Detrembleur*'s research group[1,2] These CO_2-based building blocks react with biobased polyols by a step-growth type reaction which occurs quickly with a small amount of an organocatalyst, and in solvent-free conditions at ambient temperature. The functionality of the polyols can be modified to switch from linear polycarbonates with diols, to cross-linked polymers when increasing the functionality of the alcohol. The facile handling of this polymerization process compared to the conventional ones opens new fields of applications for polycarbonates, for example coatings, as this polymer family is well-known for their huge shock resistance and transparency. Moreover, the chemical recycling of the structure will be investigated by aminolysis[3], allowing the recovery of molecules of interest for further polymerization. This research project aligns with the green chemistry principles, focusing on CO_2 valorization, employing mild reaction conditions, and promoting polymer circularity for enhanced sustainability.

References

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