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Synthesis of well-controlled amorphous vitrimers

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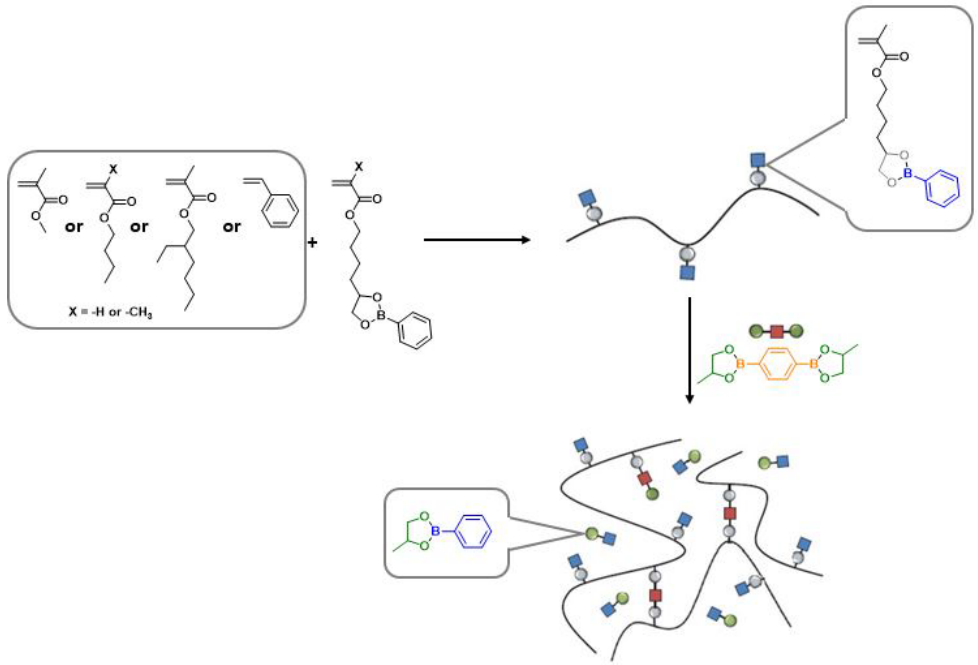
The aim of the project is to use fine synthetic procedures to control different parameters in the synthesis of dioxaborolane-based polystyrene, polymethacrylate and polyacrylate vitrimers to uncover new structure-property relationships. The synthetic procedure consists of the preparation of functional monomers possessing chemical groups capable of dynamic cross-linking[1] and then copolymerizing them via different polymerization methods with commercial monomers. Once a thermoplastic functional precursor has been obtained, varying quantities of a dynamic cross-linking agent are added, thus producing a vitrimer[2]. After the synthesis of these materials, the thermal, thermomechanical and rheological properties are studied, which are fundamental to assert the formation of a dynamic network and also to understand the impact of key structural parameters, such as dispersity, molar weight, and the percentage of cross-links. The results obtained so far show how some steps of the synthesis can significantly impact the final properties of the materials, leading to the adventitious formation of static crosslinks that slow down the dynamics of the network. Furthermore, it has been experimentally observed how the synthetic procedure to obtain the vitrimer precursors can significantly influence their final stability. Consequently, a particular focus will be on the practical optimization of these synthetic steps to obtain stable materials with the desired final properties while minimizing the occurrence of unwanted side reactions.



References:

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