Design and synthesis of high Tg thermoplastic polyhydroxyurethanes by reactive extrusion

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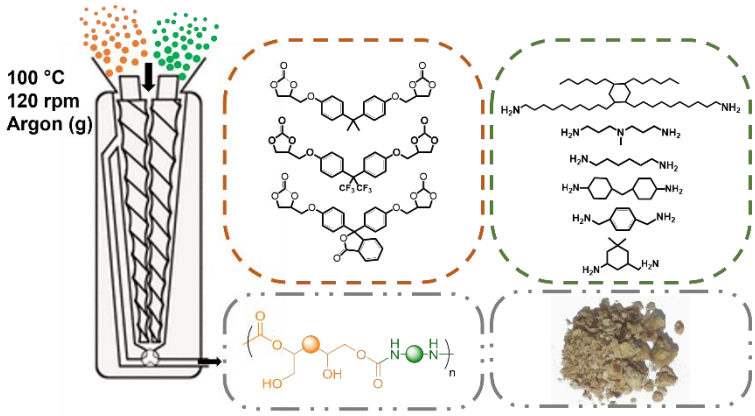
Polyurethanes (PUs) are common commodity plastics that cover a wide range of applications. However, PUs are based on isocyanates, toxic compounds that pose respiratory and dermal hazards. As a more sustainable alternative, polyhydroxyurethanes (PHUs) have gained attention as PU substitutes[1,2]. However, their utility is often limited by low molecular weights and inferior properties. To overcome these shortcomings, the present study focuses on the application of reactive extrusion to the synthesis of thermoplastic PHUs, allowing for rapid production without compromising molecular weight. Careful selection and target-oriented synthesis of monomers has enabled the production of a series of linear PHUs with high T_g (to 90 °C), high strength (to 60 MPa), and good thermal stability. Validation of this approach with a range of different monomers provides ample opportunity for the tuning of PHU performance as well.

Key words: Non-isocyanate polyurethane, reactive extrusion, polymer synthesis.



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