

Influence of Diamine Structure on the Mechanical Performance of Polyhydroxyoxazolidone Elastomers

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Thanks to their remarkable combination of mechanical strength, biocompatibility, and long-term stability, segmented polyurethanes are widely used as reference materials in biomedical applications. Due to safety issues related to traditional synthesis routes involving isocyanates, alternative chemical strategies have been developed, leading to the emergence of isocyanate-free polyurethanes with a novel structure featuring hydroxy-oxazolidone functions, namely polyhydroxyoxazolidones (PHOx) [1].

PHOx are synthesized via a step-growth polymerization based on the addition reaction between a diamine and a bis(α -alkylidene cyclic carbonate) (Bis α CC) (Figure 1). PHOx elastomers have been previously achieved using a range of amine-terminated soft segments, including PDMS and PPG. Recent studies have demonstrated the excellent biocompatibility of these materials. In particular, PDMS-PHOx [2] and PPG-PHOx [3] systems exhibit remarkable bio- and hemocompatibility, surpassing those of conventional medical-grade polyurethanes, so that PHOx emerge as attractive biomaterials for engineering medical devices, such as catheters or heart valves.

This study explores how the incorporation of small-molecule diamines in combination with PDMS diamine soft-segments impacts the mechanical behavior of PHOx elastomers. The ultimate objective is to establish structure–property relationships that enable the rational design of elastomeric PHOx formulations tailored for biomedical applications.

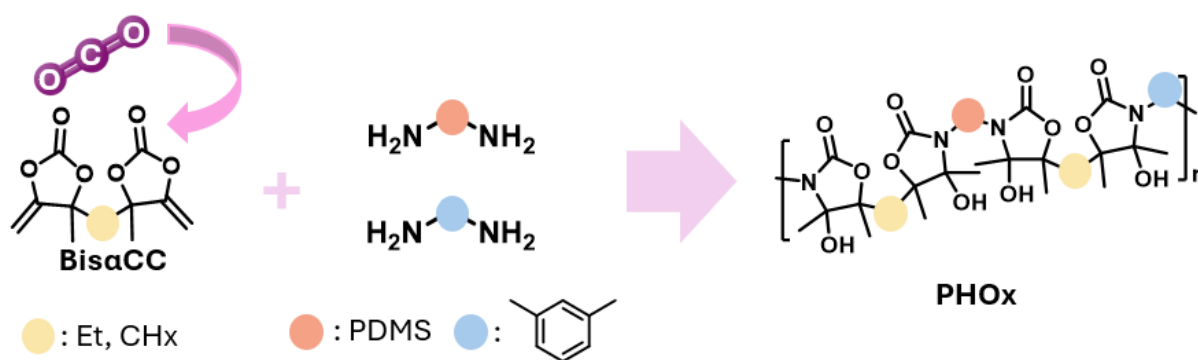


Figure 1: Synthesis of POx networks starting from Bis α CC

Référence :

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2. Melo, Sofia F., et al. "Poly(Hydroxy-oxazolidone) Thermoplastic Elastomers for Safer, Greener and Customizable Blood-Contacting Medical Devices." *Advanced Healthcare Materials.*, 2025, <https://doi.org/10.1002/adhm.202502670>.
3. Pierrard A., et al. "Synthesis of Polyether–Polyoxazolidone Networks for the Design of 2 Drug-Eluting Implants." *Biomacromolecules.*, 2026, <https://doi.org/10.1021/acs.biomac.5c02534>