ENHANCEMENT OF MECHANICAL PROPERTIES OF BIODEGRADABLE THERMOPLASTIC POLYURETHANE POLYMERS FOR THEIR APPLICATION AS ARTIFICIAL BLOOD VESSELS

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Cardiovascular diseases are some of the most common causes of premature death worldwide [1]. Usually surgical intervention is necessary for the treatment of the disease, of which available options for action are limited: The use of autografts is restricted which is mainly accounted for by accessibility. State of the art artificial grafts lack long-term patency, especially with respect to small diameter vessels. Furthermore, such substitutive materials are more likely to cause infection [2].

This project aims to overcome these deficiencies. Biodegradable thermoplastic polyurethane linear block polymers of the first generation bearing an aliphatic diisocyanate could be processed to small diameter vascular grafts via electrospinning [3], [4]. Despite this novel material's sufficient performance during in vivo studies, ameliorations of mechanical properties are desirable. Current research focuses on the substitution of applied diisocyanates with alicyclic options (Fig. 1). Enhanced mechanical properties could be observed by DMTA, DSC and tensile testing in some TPUs synthesized with alicyclic diisocyanates, giving comparable results to the non-degradable benchmark Pellethane. The concept continues to stimulate native tissue regeneration during biodegradation of the artificial graft and therefore avoids the problem of non-patency.

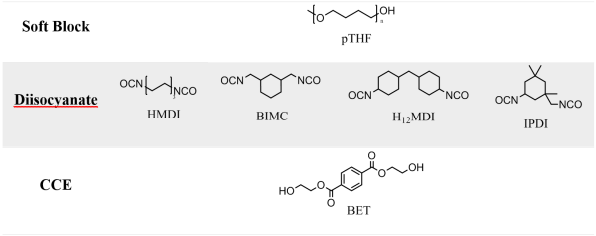

Fig. 1: Chemical structures of poly(tetrahydrofuran) (pTHF, soft block), hexamethylene diisocyanate (HMDI), 1,3-bis(isocyanatomethyl)cyclohexane (BIMC), 4,4'-methylene-bis(cyclohexylisocyanate) (H12MDI), isophorone diisocyanate (IPDI), and bis(2-hydroxyethyl)terephthalate (BET, cleavable chain extender CCE).

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