

Bio-based isocyanate free polyurethane textile coatings: the new kid in the block

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"Bio NIPU", an Interreg Flanders-Netherlands project, focuses on the development of 100% bio-based and isocyanate-free polyurethane (bio NIPU) for end products in the textile and synthetic rubber industry. The production of biopolymers for commercial applications is increasing year after year. However, biopolymers for textile coatings and synthetic rubber (elastomers), such as polyurethane, are only available for a limited number of applications and are not fully bio-based. Polyols and isocyanates are used for the synthesis of polyurethane. A proposal to limit the use of isocyanates has been adopted at European level (1).

The Bio NIPU project therefore focuses on research into alternative building blocks for the synthesis of polyurethane. Fully renewable raw materials - such as residual flows from sugar refining and the production of biodiesel and natural oils and fats - are used to develop bio NIPU. The project consortium consists of Centexbel, Limburgse Urethaan Chemie, Maastricht University, Stahl and Thomas More.

Synthesis of bio NIPUs textile coatings that are environmentally friendly relies on the development of waterborne bio NIPU dispersions. To yield these dispersions, the synthesis of long and partially hydrophilic NIPU chains to obtain a stable NIPU is necessary. Building long NIPU chains has already been described in the literature to be one of the toughest challenges for the development of these new materials. To tackle this issue, a two-step synthesis route inspired by the conventional polyurethane synthesis has been designed. In a first step, a NIPU prepolymer with reactive ends is synthesized and, in a second step, this NIPU prepolymer is chain extended and dispersed into water. Based on the structure of the

polyurethanes used for waterborne dispersions, similar bio-based building blocks are selected to yield bio NIPU coatings with desired properties for textile coating.

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References:

- (1) <https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/Ob0236e180876053>



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