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# PROJECTE DE DOCTORAT INDUSTRIAL EXPEDIENT 2016 DI 041

## DADES DE L'EMPRESA I DE L'ENTORN ACADÈMIC

**Títol del projecte**

Functionalization of Polyurethanes

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## BREU DESCRIPCIÓ DEL PROJECTE DE RECERCA

Polyurethanes (PUs) are one of the most important classes of polymeric materials with a huge variety of applications in automotive, building and construction, flooring and packaging or in the medical field. Because of their diverse utility and relatively low cost, these materials account for nearly 7 wt% of total worldwide polymer production and are expected to exceed 18,000 kilotons annually by 2016.

PUs are usually prepared by reaction of polyols and isocyanates. Alternative and greener approaches have been developed for the synthesis of more sustainable PUs, including the utilization of less toxic isocyanate-free approaches, advances on PU platforms based on renewable resources and the transition from organic solvent based PUs to water-dispersed PUs (PUDs) to reduce the emission of the volatile organic compounds to the atmosphere.

For many of their applications, PUs should bear functionalities enabling tuning final material properties. The functionalization of PUs can be accomplished incorporating functional groups into monomers and further polymerization, post-polymerization functionalization or by combining both strategies.



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The main goal of this project is to develop new and sustainable strategies for the functionalization of PUs. The selective post-polymerization functionalization of pendant and end groups will be studied to modulate the final PU properties. Isocyanates are toxic and unstable due to their ability to react with proteins, deactivate enzymes, destroy cells and damage DNA. The high reactivity and sensitivity to moisture make them difficult to handle and the conventional solution in coating and paint industries. Consequently, a possibility to overcome these drawbacks consists in blocking isocyanates. PU with blocked-isocyanates groups are used as additives in acrylic resins and water-based polyurethanes to improve its properties as hardness or chemical resistance. Thus, when temperature is applied to the resin containing the additive, the blocking agent is released so that the free isocyanate groups can react with alcohols or amines. The development of new strategies to functionalize isocyanates will be of substantial interest.