



Melania Bednarek

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Scopus bibliometric data: citations 1271 · documents 58 · h-index 19

Currently held positions

Division of Functional Polymers and Polymer Materials, Centre of Molecular and Macromolecular Studies of the Polish Academy of Sciences

Łódź

ASSISTANT PROFESSOR

Scientific profile and collaborations

My scientific interests focus on various aspects of polymerization processes that lead to well-defined products, as well as the functionalization of the resulting polymers. One of the primary polymerization processes I study is the ring-opening polymerization of cyclic ethers and esters, which is carried out in the presence of various catalysts and proceeds via different mechanisms. These polymerization processes yield a range of products, including high-molecular-weight polymers, oligodiols, and multifunctional branched polymers.

A significant part of my recent research is dedicated to biodegradable polyesters, particularly polylactide, which has recently gained technological importance. I am also interested in the chemical functionalization of polyesters (including polylactide), both after their synthesis and during their formation. To achieve this, we employ organic reactions that enable functional group transformations, including "click" reactions. Functionalized polyesters are then used for further synthesis, such as the development of block copolymers, polyurethanes, or dynamic polymer networks, with the goal of modifying the properties of polymeric materials.

The syntheses of polyurethanes based on polyesters, their modification via click reactions, and the preparation of polyester-based polymer networks has been conducted in collaboration with the Polymer Chemistry Research Group at Ghent University in Belgium (Prof. F. du Prez).

In work aimed at obtaining specific products, I also use controlled radical polymerization processes such as polymerization with the participation of an iniferter or ATRP (collaboration with prof. S. Hvilsted group at the Technical University of Denmark).

Selected publications

- 2001 **Multihydroxyl Branched Polyethers. 2. Mechanistic Aspects of Cationic Polymerization of 3-Ethyl-3-(hydroxymethyl)oxetane** [\[link\]](#)
- 2011 **Combining Cationic Ring Opening Polymerization and Click Chemistry for the Design of Functionalized Polyurethanes** [\[link\]](#)
- 2023 **Polylactide-based networks containing dynamic tetraphenylethane groups for 3D printed repairable and reprocessable constructs** [\[link\]](#)

Research grants

Project Manager: 5 grants: KBN, NCN

Co-Manager: 3 Projects within Polish-Belgian scientific exchange

Co-Investigator: 5 grants: MNiSW, KBN, POIG

Obtained patents

3 patents given by Polish Patent Office

International research stays

Denmark (Lyngby): Technical University of Denmark, Department of Chemical Engineering, prof. S. Hvilsted

Belgium: Ghent University, Polymer Chemistry Research Group, prof. E. Goethals