



Tomasz Makowski

ASSOCIATE PROFESSOR – CMMS PAS · LEADER OF SOFT MATTER SURFACE STRUCTURE GROUP – CMMS PAS

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Currently held positions

Department of Polymeric Nano-Materials, Centre of Molecular and Macromolecular Studies of the Polish Academy of Sciences

Łódź

ASSOCIATE PROFESSOR

Centre of Molecular and Macromolecular Studies of the Polish Academy of Sciences

Łódź

LEADER OF SOFT MATTER SURFACE STRUCTURE GROUP

Scientific profile and collaborations

My scientific research focuses on the **surface structure and properties of soft matter**, particularly **biodegradable polymers of agricultural origin**. I am actively involved in developing **chemical and physical methods for surface modification** of these polymers to enhance their functional properties. Additionally, my work includes the **fabrication and characterization of nonwoven materials** based on biodegradable agricultural polymers, aiming to optimize their physical and mechanical performance.

My research also explores the **physicochemical properties of thin, oriented organic layers**, including their **phase transitions** and **electrical characteristics**. I employ advanced surface analysis techniques, such as **X-ray diffraction (XRD)** and **atomic force microscopy (AFM)**, to investigate the structure and morphology of these layers at the nanoscale.

Another important aspect of my work is the **fabrication of highly oriented thin films** composed of small organic molecules and polymers, which exhibit **anisotropic optical properties** and **nonlinear optical effects**. These studies contribute to the development of materials for applications in **photonics** and **optoelectronics**.

My research integrates **materials science**, **surface physics**, and **polymer chemistry**, with the dual aim of advancing fundamental knowledge about **soft matter interfaces** and developing **novel materials with tailored properties**. Through **interdisciplinary collaborations**, my work has the potential to impact a wide range of applications, including **sustainable materials**, **biomedical devices**, and **optical technologies**.

Selected publications

- 2023 *Electrically conductive crystalline polylactide nonwovens obtained by electrospinning and modification with multiwall carbon nanotubes* [\[link\]](#)
- 2024 *Cytotoxicity studies and antibacterial modification of poly(ethylene 2,5-furandicarboxylate) nonwoven* [\[link\]](#)
- 2025 *Fluorescent composite films of oriented cellulose nanocrystals with fluorescein* [\[link\]](#)

Research grants

Principal Investigator: 2 grants: NCN

Project Manager: 2 grants: NCN

Co-Investigator: 8 grants: NCN, POIG, RTN THREADMILL

Obtained patents

2 patents given by Polish Patent Office

International research stays

Germany, Mainz, Max-Planck-Institut für Polymerforschung, in the team prof. Dr. Klaus Müllen

Czech Republic, Prague, The Institute of Macromolecular Chemistry, Czech Academy of Sciences (IMC), in the team of prof. Miroslav Slouf