



Slovak Society of Chemical Engineering  
Institute of Chemical and Environmental Engineering  
Slovak University of Technology in Bratislava

## PROCEEDINGS

51<sup>st</sup> International Conference of the Slovak Society of Chemical Engineering SSCHE 2025

Hotel DRUŽBA  
Jasná, Demänovská Dolina, Slovakia  
May 27 - 30, 2025

Editors: Assoc. Prof. Mário Mihaľ

ISBN: 978-80-8208-158-2, EAN: 9788082081582

Published by the Faculty of Chemical and Food Technology Slovak Technical University in Bratislava in Slovak Chemistry Library for the Institute of Chemical and Environmental Engineering; Radlinského 9, 812 37 Bratislava, 2024

Kříž, F., Nguyen, V., Tokárová, V.: Microstructured PDMS surfaces for bacterial adhesion control, Editors: Mihaľ, M., In *51st International Conference of the Slovak Society of Chemical Engineering SSCHE 2025*, Jasná, Demänovská Dolina, Slovakia, 2025.

## **Microstructured PDMS surfaces for bacterial adhesion control**

Filip Kříž, Viet Tomás Nguyen, Viola Tokárová

*University of Chemistry and Technology Prague, Technická 5, 166 28 Prague, Czech Republic*

*e-mail: Viet.Tomas.Nguyen@vscht.cz*

Replicating the intricate natural microenvironments is vital for developing advanced biomedical applications, yet conventional flat surfaces inadequately mimic these conditions, limiting progress in fields such as anti-biofouling and biomedical device design. To address this challenge, we engineered bioinspired microstructured surfaces on polydimethylsiloxane (PDMS) substrates, aiming to modulate bacterial adhesion behavior. Using maskless photolithography to create master molds and soft lithography for negative replication, we fabricated arrays of circular and rectangular microstructures in various sizes (down to 5  $\mu\text{m}$ ). Process parameters including exposure dose and baking times were optimized for structural precision. Topographical features were characterized using scanning electron microscopy and optical profilometry. The influence of surface topography on bacterial adhesion was then assessed using *Escherichia coli*, with adhesion levels quantified after incubation. Compared to flat PDMS controls, structured surfaces exhibited variations in bacterial adherence, depending on geometry and scale. Our findings underscore the potential of precisely engineered microstructured surfaces in controlling bacterial-surface interactions, opening avenues for applications in healthcare, bioengineering, and surface science.