



**UNIVERSITY of
DEBRECEN**

Faculty of Engineering
Department of Mechanical Engineering

Book of Abstracts from the 10th International Scientific Conference on Advances in Mechanical Engineering (ISCAME 2024)

7-9 November, 2024 Debrecen, Hungary

organized by

**Department of Mechanical Engineering
Faculty of Engineering, University of Debrecen
and
Working Commission in Mechanical Engineering
Specialized Committee in Engineering
Regional Committee in Debrecen, Hungarian Academy of Sciences
and
Scientific Association of Mechanical Engineers**

Project no. MEC_SZ_149279 has been implemented with the support provided by the Ministry of Culture and Innovation of Hungary from the National Research, Development and Innovation Fund, financed under the Mecenatúra funding scheme.



**PROGRAM
FINANCED FROM
THE NRDI FUND**



Copyright © 2024 Trans Tech Publications Ltd, Switzerland

Trans Tech Publications Ltd
Seestrasse 24c
CH-8806 Baech
Switzerland
<https://www.scientific.net>

Scientific Books of Abstracts

Full text available online at <https://www.scientific.net>

Distributed worldwide by

Trans Tech Publications Ltd
Seestrasse 24c
CH-8806 Baech
Switzerland

Phone: +41 (44) 922 10 22
e-mail: sales@scientific.net

Relationship between the Developed Interfacial Area Ratio and the Adhesion of the Bonded Joint

Benjámín Márk Körömi^{1,2,a*}, Zoltán Weltsch^{3,b} and Miklós Berczeli^{1,c}

¹Department of Innovative Vehicles and Materials, GAMF Faculty of Engineering and Computer Science, John von Neumann University, Kecskemet, Hungary

²Department of Road and Rail Vehicles, Doctoral School of Multidisciplinary Engineering Sciences, Szechenyi Istvan University, Győr, Hungary

³Department of Road and Rail Vehicles, Zalaegerszeg Innovation Park, Szechenyi Istvan University, Győr, Hungary

^akoromi.benjamin@nje.hu, ^bweltsch.zoltan@sze.hu, ^cberczeli.miklos@nje.hu

Keywords: Surface Micro-Structuring, Developed Interfacial Area Ratio, Adhesive, Adhesion.

Abstract. Adhesion and bonding technologies have undergone significant development in recent decades, resulting in a crucial role in the field of joining technologies. Adhesive bonds, as joining techniques, largely depend on the chemical composition of the adhesive or bonding material. It is also important to note that the nature and quality of an adhesive bond are greatly influenced by surface adhesion and the phenomenon of surface attachment. From a materials science perspective, surface adhesion is characterized by the level of surface wetting and the total value of surface energy. Additionally, micro-topographies and other geometric features play a key role in the formation of the bond. In this research, our aim to create controlled micro-topographies on the surfaces of various materials, primarily through pulsed laser beam surface treatment techniques. We also intend to analyze the ability of adhesives to fill the micro-topographies, that is, to what extent and in what manner adhesives can fill micro-level geometries and structures. This will help us to establish correlations between the strength of adhesive bonds and the shape characteristics of the micro-topography, in both surface-activated and non-surface-activated states.

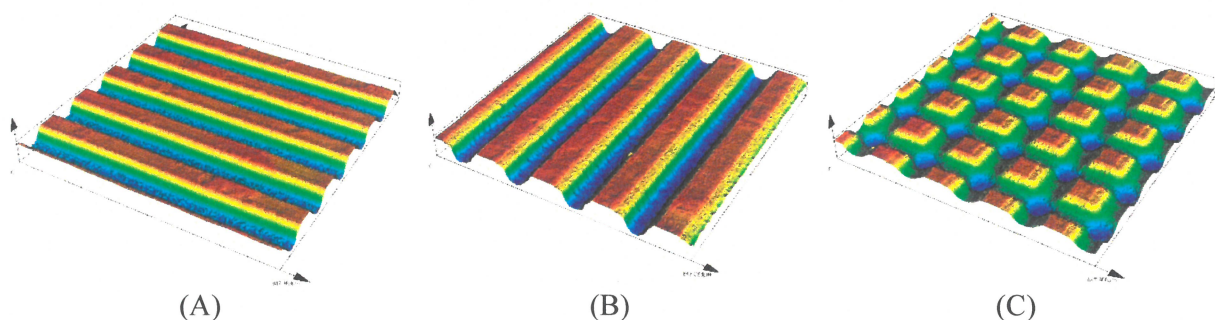


Fig. 1. Micro-structures created with a femtosecond laser beam (Type A, B, C)

Fig 1. shows the three types of micro-structures created. In the following steps, we will modify the relative surface area ratio (developed interfacial area ratio (Sdr %)) in a controlled manner by changing the geometric dimensions and characteristics of the created micro-structures. In some cases, we will also examine the strength of the adhesive bonds in both surface-activated and non-surface-activated states.