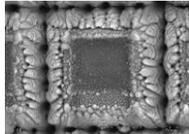
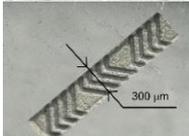
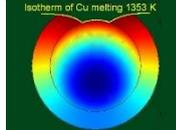
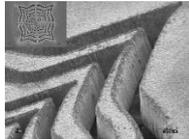
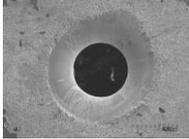




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<p>name of division :</p> <p style="text-align: center;">DIVISION OF MATERIALS ENGINEERING AND MEASUREMENT SYSTEMS</p> <p style="text-align: center;">Institute of Electrical Engineering Systems of the Lodz University of Technology</p>		<p>symbol:</p> <p style="text-align: center;">I26</p> <p style="text-align: center;">https://matel.p.lodz.pl</p>
<p>kierownik:</p> <p style="text-align: center;">Prof. Ryszard Pawlak, PhD, DSc</p>	<p>potencjalni promotorzy:</p> <p style="text-align: center;">Prof. Ryszard Pawlak, PhD, DSc</p>	<p>contact person:</p> <p style="text-align: center;">Mariusz Tomczyk, PhD, Eng.</p> <p style="text-align: center;">phone: 42-631-25-37</p> <p style="text-align: center;">mariusz.tomczyk@p.lodz.pl</p>
<p>activity scope:</p> <p>The main fields of research include 2D and 3D laser micro-technologies for electronics and microsystem technology :</p> <ul style="list-style-type: none"> • Laser modification of properties of a surface of conductive, semiconductor, ceramic and polymer materials. • Manufacturing of prototypical 3D microstructures in semiconductor, ceramic and metallic materials. • Production of 2D microstructures in thin metallic and graphene layers, and in layers of transparent conductors. • Laser synthesis of materials in the surface layer or in the micro-volume. • Study of the properties of manufactured structures. • Modeling of laser micromachining processes. 		     
<p>current activity :</p> <p>Laser modification of the hydrophobic properties of acrylonitrile and styrene-butadiene rubbers doped with carbon nanotubes and graphene.</p> <p>Hydrophobization of polymeric materials used in the production of personal protective equipment.</p> <p>Investigation of the influence of laser radiation absorbers on the effectiveness of interaction of the laser beam with polymer materials.</p> <p>Production of sensory structures and passive electronic elements (electrodes in organic electronics devices - OLED and OFET, thermoresistors, coils) in thin layers of transparent conductive materials (AgHT, ITO, ZnO, graphene).</p> <p>Production of sensory structures and passive electronic elements in metallic layers on textile substrates.</p> <p>Mask technology for textronics and organic electronics technology.</p> <p>Laser synthesis of conductive layers (of Al) on the ceramic substrate (AlN).</p>		



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<p>future activity: Research in the field of laser material microtechnologies with the use of various types of lasers.</p>	
<p>publications / patents / awards / grants : Irzmańska, E., Korzeniewska, E., Pawlak, R., Smejda-Krzewicka, A., Adamus-Włodarczyk, A., Enhanced hydrophobicity of polymers for personal protective equipment achieved by chemical and physical modification, <i>Materials</i>, 2022, 15(1), 106 Siciński M., Korzeniewska E., Tomczyk M., Pawlak R., Bieliński D., Gozdek T., Kaluzińska K., Walczak M., Laser-textured rubbers with carbon nanotube fillers, <i>Polymers</i>, Vol. 10, Issue 10, 2 October 2018, Pawlak, R., Lebioda, M., Rymaszewski, J., ...Kolodziejczyk, L., Kula, P., A fully transparent flexible sensor for cryogenic temperatures based on high strength metallurgical graphene, <i>Sensors (MDPI)</i>, 2017, 17(1) Lebioda, M., Pawlak, R., Szymański, W., Kaczorowski, W., Jeziorna, A., Laser patterning a graphene layer on a ceramic substrate for sensor applications, <i>Sensors (Switzerland)</i>, 2020, 20(7), 2134, Tomczyk M., Kubik P., Waliszewski W., Optimization of the ablative laser cutting of shadow mask for organic FET electrode fabrication, <i>Electronics</i> Vol. 9, Issue 12, December 2020 Lebioda, M., Pawlak, R., Rymaszewski, J., Joining of electrodes to ultra-thin metallic layers on ceramic substrates in cryogenic sensors, <i>Sensors</i>, 2021, 21(14), 4919 Patent - P.420228 (2017): Sposób wytwarzania warstw superhydrofobowych na powierzchni kauczuków akrylonitrylowego i butadienowo-styrenowego, zawierających nanorurki węglowe. Patent - Pat.238762 (2021) Sposób zmniejszenia tendencji wyrobów tekstylnych do pillingu</p>	
<p>keywords: laser micromachining, laser ablation, organic electronics, surface hydrophobization, 2D and 3D structures</p>	
<p>list of internships in a given research group : Cooperation in the field of laser micro-technological processes, design, production and testing the properties of 2D and 3D structures</p>	