# Abstract for Oral presentation

## Advanced Materials and Bioactive Surfaces for Implant Applications

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**Abstract**

We address a detailed biomedical research presenting various high-tech biomaterials and nanotechnology-based bioactive surface architectures covering both permanent and biodegradable implant applications. These complex materials provide local antibacterial and cell-proliferative platforms towards "ideal implants" with combined properties. The used nano-objects are based on ultrapure gold, platinum, silver or iron nanoparticles, equipped with biological functions for specific cellular actions via full-embedding into polymeric matrices or used as coatings on metallic and ceramic implants.
Instead of standard fabrication that often fails in terms of material purity and biocompatibility, we demonstrate short-pulsed laser ablation in liquids offering an entirely precursor-, and stabilizer-free "green" method, forming contamination-free nanomaterials with remarkable biological properties. We highlight high-throughput industrial processing capabilities of these composites via injection molding and extrusion resulting in a homogenous embedding even in the melted state due to an effective stabilization process during laser ablation that hinders inter-particular agglomeration. This very high homogeneity and stability is especially crucial for polymeric implant, catheterization and permanent cardiovascular applications where homogenous surface activity is required. Concerning metallic implant applications, equal channel angular pressing a new industrial processing route is demonstrated. It allows the formation of ultrahigh-strength biometals such as low-alloyed magnesium, surgical-steel and titanium-alloys targeting a broad range of medical applications from orthopedic, dental to cardiovascular implantology. In case of magnesium, the desired combination of high biocompatibility, tailored mechanical and degradation properties as well as excellent mechanical properties will be presented and compared to state-of-the-art materials such as the extra-low interstitial Ti 6Al-4V titanium alloy or the unalloyed commercially pure titanium. Finally, we report on the detailed mechanical and corrosive properties providing deep insights into its biophysical performance, long durability and mechanical strength even in a biological environment.

Keywords: Bioactive surfaces, High-strength biometals, Nanofunctionalized ceramics, Long-term bioactivity

**Professional Biography**
Graduated as a physicist in 2004 in Hungary, received a PhD in material sciences in 2007 in France, post-doctoral fellow between 2008-2009 in Australia later scientist then head of a research group in Germany between 2009 and 2017. Co-Founder of the high-tech laser company Laser nanoFab GmbH in Germany. At present, Dr. Sajti is head of the research group

Advanced Implant Solutions at the AIT Austrian Institute of Technology in Austria. His group focuses on the development and application of new biomaterials and process technologies improving major material characteristics and designs of innovative implants. His team collaborates closely with leading national and international research institutions and medical companies focusing on both permanent and biodegradable implant solutions providing excellent biocompatibility, tailored material and surface properties such as longer service life and higher patient comfort.



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**Any Comments:**

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