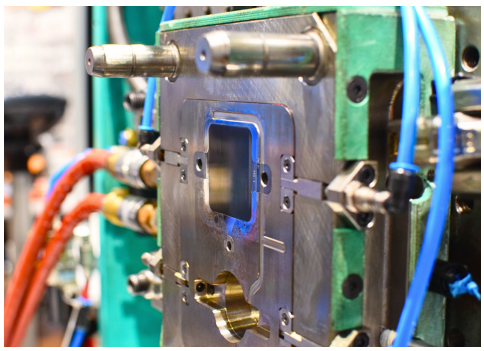
SYNTECS PRESS RELEASE

SUSTAINABLY AND DIGITALLY DRIVEN HIERARCHICAL LASER TEXTURING FOR COMPLEX SURFACES

SYNTECS brings together a consortium of industry leader, academic and research organisations that are at the forefront of laser-based processing. SYNTECS is designed to tackle the multiple challenges experienced with current chemical and mechanical surface treatments. During the project 3 case studies will be studied and investigate to demonstrate the advantages of the SYNTECS project. Hereby are described these 3 Case studies.

1



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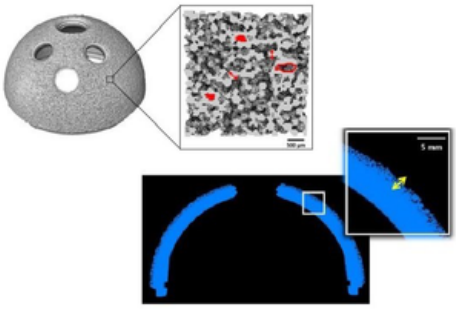

3

1. SYNTECS | Complex shaped copper vapour chamber (VC)
2. SYNTECS | Stainless steel mould inserts for modular mould tool
3. SYNTECS | Representative orthopaedic implant geometries[1]

[1] **Dall'Ava et al. 2020. J Orthop Surg Res. Reproduced under the terms of CC BY 4.0**

SYNTECS Case Studies Complex shaped coppervapour chamber (VC)

SYNTECS will use Laser Surface Texturing to improve the cooling efficiency achieved by sintered wick vapour chambers (by up to 48%) by enabling enhanced water/vapour transport and evaporation. The multi-axis SYNTECS machine will enable texturing on surfaces of top and bottom plates which have complex geometries in the X, Y and Z planes.

Direct Laser Writing (DLW) will be used to produce 50-200 µm grooves on the plates, with aspect ratios (3-5) that could not be achieved by mechanical methods.

These grooves will support long-range capillary action to pull water around the system. Direct Laser Interference Patterning (DLIP) (10-20 µm) and Laser Induced Periodic Surfaces Structuring (LIPSS) (100-200 nm) hierarchical texturing on top of the grooved structure will promote tangential transport of water between the grooves and give a larger surfacearea for evaporation.

The use of Ultra-Short Pulse (USP) burst mode will be used to enhanceablation efficiency (to >5 μm^3 /µJ, 10x enhancement vs single pulse USP processing) to bring the process in line with industrial expectations for the production of ~5M VCs/ year.

Stainless steel mould insertsfor modular mould tools

Texture development on mould inserts will allow flexibility to transfer surface textures to different interior automotive components such as grained instrument panel casing for Electric Vehicles.

SYNTECS will develop nano & micro scale laser texture development on the injection steel mold surface, aiming to have better texture transfer efficiency, reduced clamping force, better processability of recycled materials and longer lifetime of the mould.

For injection molded parts the engineered textures will confer higher scratch resistance and enhanced antimicrobial performance for the selected use-case.

Finally, replacing current technology with new texture application will reduce the environmental footprint of tool making through eliminating the need for chemical etching process which has a high carbon footprint.

Representative orthopaedic implant geometries

Life expectancy is rising and so orthopaedic implants must be designed for longer lifetimes and with improved properties. Device manufacturers are seeking solutions to surface engineer implants for improved initial stability, osseointegration and anti-microbial properties. DLW will be used to produce surface structures to maximise initial implant stability.

DLIP and LIPSS will be used to produce multi-functional textures with controlled roughness. The combination of DLIP, DLW and LIPSS in a single laser processing system may also potentially replace several separate processes and improve overall process sustainability.

Partners

The consortium consists of world class research organisations including Fraunhofer IWS and Fraunhofer IML (Germany), the University of Birmingham (UK), Centre Technique Industriel de la Plasturgie et des Composites – IPC (France), IST-ID (Portugal), Manufacturing Technology Center (UK) and the European Federation for Welding, Joining and Cutting (Belgium). Bringing their technology expertise are Laser Engineering Applications SA - LASEA (Belgium), Fusion Bionic (Germany), 3 Drivers (Portugal) and Iconiq Innovation Ltd (UK). End users providing application case studies in the automotive, medical, and electronics sectors are Centro Ricerche Fiat - CRF (Italy), Farplas Otomotiv Anonim Sirketi (Türkiye), DePuy Synthes (Ireland), and European Thermodynamics Limited (UK).

About the SYNTECS Project

www.syntecs-laser.eu

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