**Press Release**

# Laser-engraved metal to reduce environmental impact

***Anti-fouling, 'hydrophobic' metal or plastic surfaces, engraved by a new laser technology being developed by European scientists, could soon replace the toxic varnishes used in ship coatings to stop algae or barnacles sticking to hulls - reducing maintenance costs, fuel bills and $CO_2$ emissions.***

Harnessing new photonics technology, a group of European scientists are currently developing a 1kw, 'dot matrix' ultrafast laser system that can carve flow-optimised metal or plastic surfaces capable of imitating the incredibly efficient skin from sharks.

Etching tiny 'spike' structures onto sheet metal or plastic, the new laser system can create a rough surface at a microscopic level. This uneven topography can create a reduction in drag or inhibit the growth of bacteria, algae or even barnacles.

Shark's flesh, covered in millions of microscopic denticles - or tiny protruding scales - reduces drag to make it a highly efficient swimmer.

Similarly, engraved metal or plastic surfaces can have 'anti-fouling' properties that prevent contaminants or microorganisms from clinging on.

Funded by the Photonics PPP, the scientists behind the €4.7 million laser project hope that specially-designed structures on steel ship hulls might help to reduce fuel consumption and replace toxic ship paints and varnishes that are harmful to the environment.

Dr Johannes Finger, coordinator of the MultiFlex project, said: "Laser-fabricated surface structures have the potential to reduce friction and to prevent the growth of plants and algae. This could significantly reduce ship repair, maintenance, $CO_2$ emissions and fuel bills while providing an alternative to harmful coatings that are toxic to the environment."

"Besides maritime components, application fields can be found in aircraft and turbomachinery. Here, surface structures might inhibit cavitation and thus improve lifetimes of propellers of propulsion systems or water turbines.

"Our photonics system can also create design textures or 'microcavities'. Here the environment benefits by replacing environmental problematic technologies like chemical etching," said Dr Finger.

Ultrashort Pulsed (USP) or 'Ultrafast' lasers can ablate any material without damaging it. Surfaces cut with a USP are smooth, on a micron-scale and ideal for many industries where hard materials need to be processed with the highest precision.

## Dot Matrix Laser

Developed by the MultiFlex project, the material is structured by the world's first 'dot matrix' laser.

In the same way that an old-fashioned dot matrix printer uses a moving head, printing in a line by line motion, the laser sends super-fast pulses of concentrated energy to ablate - or cut - materials that are notoriously difficult to work with.

Resembling a giant chessboard, the system splits a single beam into a grid of 64 'beamlets', where every single ray can be turned on, off, positioned, and individually 'tuned'.

"Existing ultrafast lasers are known for their precise ablation and cutting results. Unfortunately, processing large parts with such lasers can take weeks. Our system will ablate more than 150 $mm^3$ in one minute, therefore making it hundreds of times faster than existing technologies," said Dr Finger.

## Wider Applications

While the laser represents an exciting breakthrough in surface technology, the ultrafast laser has several wider applications:

**Tool and Mould Manufacturing** – With increased throughput, MultiFlex is making many USP mould and tool making applications, such as fabricating venting holes or microcavities, and making textures on free-form surfaces more cost-efficient. Tool and mould application is the first field where the technology will be validated.

**Automotive** - By delivering high throughput for USP surface processing technology, MultiFlex is tackling the micro-structuring applications for interior lighting, instrument clusters and aesthetic and haptic structures.

**Electronics** – Increasing the spread of ultrafast processing in electronics will improve the performance and reliability of sophisticated high-performance electronic components. Ultrafast laser-based fabrication of via holes and technical ceramics for high-performance electronics will be significantly improved.

**Printing and Embossing** – With a more economical and rapid production line, the MultiFlex system has the potential to significantly increase electronics printing, precise embossing of microstructures and the fabrication efficiency for high precision tools.

The consortium consists of the research institute Fraunhofer ILT and the Chair for Technology of Optical Systems of RWTH Aachen University from Germany as well as Amplitude Systèmes, LASEA France, AA OptoElectronic from France and LASEA from Belgium as industrial research and development partners.

The three-year MultiFlex project is supported by the European Commission within the framework of the ICT-04-2018 program and has received a grant of € 4.7 million via the Photonics Public Private Partnership.

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**About Multiflex**

Lasers with ultrashort pulses in the picosecond and femtosecond range are known for their ultra-precise ablation and cutting results, but also for their long process durations. We aim to make material processing with ultrafast lasers up to a hundred times faster by using a high-power USP laser with 1kW average power and a selective multibeam approach to deliver the power efficiently to the workpiece.

A consortium of six partners has joined forces to make the vision of fast metal processing with ultrafast lasers reality. The partners come from all over europe and each partner is a leading expert in their respective fields. Learn more.

**https://multiflex-project.eu/**

**About Photonics21**

Photonics21 is the European Technology Platform (ETP) for photonics, a technology encompassing all of the products and processes around the emission, manipulation and detection of light. Photonics is integral to a wide range of industries that include the medical, healthcare, transport, manufacturing, and telecommunications sectors.

"Photonics21" was set up in December 2005 to bring the community of photonics researchers and industries together. The European Commission defined photonics as one of five European Key Enabling Technologies (KET's) in September 2009. Shortly after, the European Research & Innovation Program "Horizon 2020" invited Photonics21 to become a "Public-Private Partnership" (PPP). The "Photonics 21 Association", a legal entity under Belgium law, became the private contract partner in November 2013 in a Public-Private Partnership (PPP) in conjunction with the EU Commission.

Today Photonics21 represents more than 3000 personal members from across Europe and abroad. Our members are experts in the photonics industry, research organisations and universities who actively engage with us to develop a joint photonics strategy for future research and innovation in Europe.

With the global photonics market growing from €350 Billion in 2011 to €447 Billion in 2015, Photonics remains a strong industry. The European photonics industry, estimated to be worth €70 billion, has considerable global leadership positions and employs over 300,000 people directly.

With positive growth forecast, current industry trends like digitalisation, resource efficiency, individual and zero failure production will drive the photonics industry further.

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