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μRevolution – worldwide most compact system for surface structuring by means of scanner-based direct laser interference patterning

Functionalization of technical surfaces by means of natural, bio-inspired structures is an innovation driver of the 21st century. The functionalities achieved are applicable for e.g. improved bio-compatibility in medical and biotechnological industries, for tribological applications in the automotive industry and for optical applications such as product and brand protection. Fraunhofer IWS has been developing modularly designed solutions for surface functionalization tasks by fabricating micrometer and sub-micrometer structures in a targeted and flexible manner. Scientists of the Fraunhofer IWS will present for the very first time the worldwide most compact system for surface structuring by means of scanner-based direct laser interference patterning at the tradeshow Laser World of Photonics in Munich.

With respect to novel, targeted surface functionalities, an efficient generation of nano- and micrometer sized structures is the greatest challenge. Established manufacturing methods such as electron beam lithography or direct laser inscription are either too cost and time consuming or only allow low structure resolution. The direct laser interference patterning (DLIP) technology developed at Fraunhofer IWS, however, offers a flexible industrial tool for the generation of targeted surface topographies for numerous applications.

In DLIP, a coherent laser beam is split into two or more sub-beams, which are superposed on the materials surface. Defined structures can be applied to components due to interference (that is a periodic modulation of laser intensity) resulting from superposition. Fraunhofer IWS scientists are able to fabricate constant structure geometries on large areas at rates of up to nearly $1 \text{ m}^2 \text{ min}^{-1}$ by means of the DLIP technology. However, the generation of variable structure geometries at high process speeds makes it necessary to develop advanced solutions.

The Fraunhofer IWS has succeeded for the first time in developing a structuring procedure able to fabricate these variable structures in short process times. The solution arises from combining a DLIP processing head with a galvanometer scanner. The system allows for a generation of micrometer structure in a range between $2 \text{ }\mu\text{m}$ and $5 \text{ }\mu\text{m}$ in an almost infinitely manner. Examples include product protection holograms patterned on-the-fly directly on the surfaces of metals, polymers, ceramics and coatings.

The DLIP galvanometer scanning system enables a significant multiplication of the process speed due to the low inertia. Clearly shorter process times, higher flexibilities and thus significant gains of competitiveness are the defined advantages of this development – a revolution in the field of surface functionalization!

Our experts are looking forward to welcoming you at the Fraunhofer IWS Dresden or at the tradeshow LASER World of PHOTONICS, hall A2, booth A2.431 (Fraunhofer joint booth).



Compact system for surface structuring by means of scanner-based direct laser interference patterning
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Decorative element „Fraunhofer IWS“ on a spoon
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