



LARGE SURFACE MICROSTRUCTURING WITH UV LASER RADIATION

Task

Using UV laser radiation to selectively ablate and modify micro- and nanometer-scale layers is an established process in display production. Since it has low optical penetration depth and short pulse duration, pulsed UV excimer laser radiation has a negligible thermal influence on the components; thus, it is qualified for the precise and gentle thin layer functionalization of conductive, semiconducting or insulating materials. In order to transfer these processing properties to a variety of coating systems especially for large area production, Fraunhofer ILT has installed and operates a UV laser-line beam system in close cooperation with Coherent.

Method

The line beam concept dispenses with movable optical components, such as classical scanners, and features pulsed UV excimer laser radiation at a wavelength of 248 nm and a pulse duration in the ns range. At a mean output power of 150 W, the system achieves pulse energies of up to 1 J. Moreover, with a fixed line focus of 155 mm length, it reaches surface rates of up to 0.5 m²/min. Depending on the application, the pulsed laser radiation used can be combined with a high-resolution mask image having rectangular field geometry. Due to the

power data and the combination of the two system concepts, a location-selective structuring with a depth resolution below 0.1 µm is possible for a wide range of materials and for a large number of processes.

Results

The line beam concept has already been used to develop a process for the large-scale ultrafine cleaning of chemically treated metal surfaces. Furthermore, Fraunhofer ILT has demonstrated the application potential of the plant for the stripping of carbon fiber components. In the process, the matrix material consisting of epoxy resin was removed in a location-selective manner.

Applications

This laser beam system provides small and medium-sized companies, across industries, with the technological basis for developing new products with innovative layer functionalities. This practice-oriented approach gives a wide range of users access to a novel, optical production process for the large-area machining of functional surfaces.

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1 LEAP excimer laser with an LB155 optics system.

2 Line beam with 155 x 0.3 mm field size.