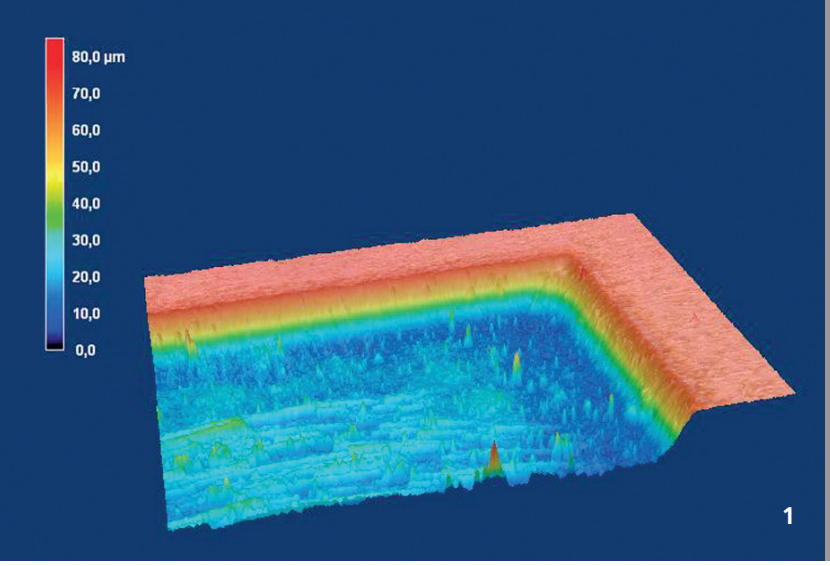

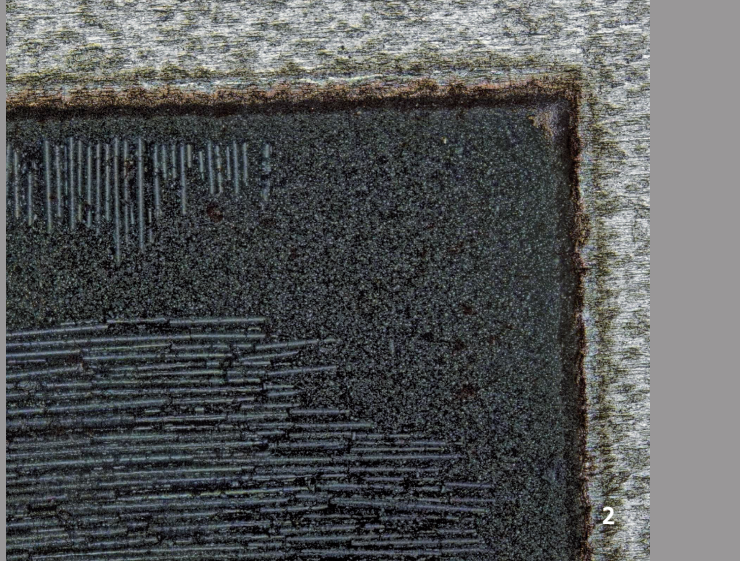

PRECISE ABLATION THROUGH PROCESS-ADJUSTED BEAM FORMING

Task

Increasingly, electronic systems are becoming highly integrated, with electronic components placed in circuit boards and optoelectronic components used in hybrid circuits. For this scale of integration, metallic coatings need to be ablated from polymeric component carriers with great precision. In this case, the industry needs to focus on flexibly producing both microscale circuit structures as well as 3D circuit structures on injection molded parts. Here, the thermal influence has to be reduced, above all when laser ablation is used, so that the substrate is damaged as little as possible. Process control plays an equally important role as it has to ensure uniform quality even with variable output conditions.

Method

To achieve these goals, Fraunhofer ILT tracked different approaches to local energy deposition by means of modulated ultrashort pulse laser radiation. Different beam geometries, such as top-hat, and various scanning strategies were examined. The experiments were also carried out at different wavelengths of the processing radiation.

Result

Thanks to beam shaping specially adapted to the process, material can be ablated precisely, selectively and with high homogeneity. An interferometric distance measuring method was used to determine the topology needed to reach the final geometry without any contact in the clamping fixture. Likewise, the machining strategy is adapted to the materials and layer sequences to be processed. Through the suitable choice of the beam shaping and machining strategy, metallic layers can be selectively ablated while damage to the substrate is avoided.

Applications

The fields of application can be found, in particular, in the market for flexible electronic substrates, especially the market for printed circuit board substrates which should soon be introduced in LEDs.

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1 3D representation of ablation geometry.

2 Ablated copper layer on PCB substrate.
Two-dimensional ablation of the copper layer on GRP.