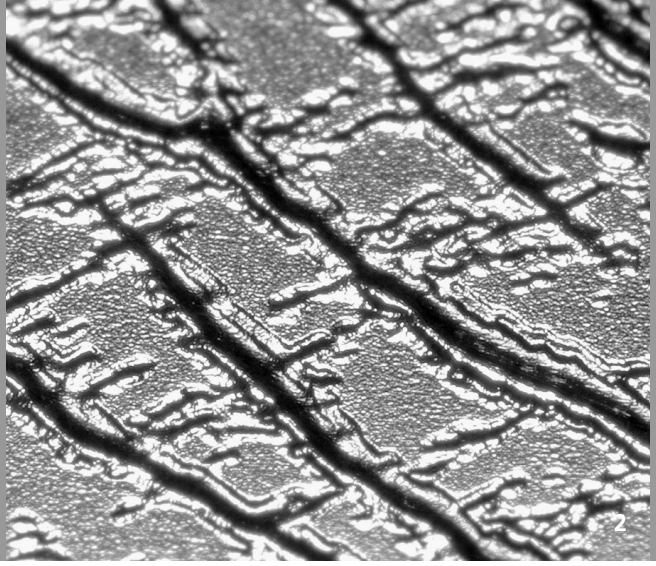

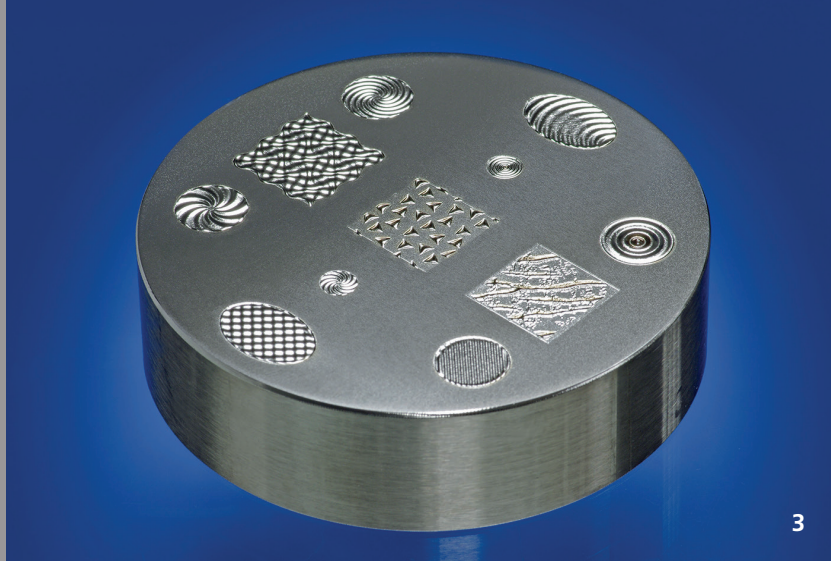

LASER REMELT STRUCTURING (LUST) ON CoCr28Mo

Task

In many industrial sectors, the structuring of surfaces has gained fundamental importance. The cobalt-chromium alloy CoCr28Mo can be found in a wide range of applications, especially in medical technology, where the focus is on implants, among others. However, structuring methods currently used (e.g., etching, laser ablation) are mostly time-consuming and/or expensive and based on structuring by removing material. In addition, both methods often produce rough surfaces, which can only be used to a limited extent for applications in the dental or implant sector. Furthermore, deficits are commonly found in the low ablation rates.

Method

For this reason, Fraunhofer ILT has developed a new process, Laser Remelt Structuring (LUST). In LUST, a laser beam melts the metal surface locally, while, at the same time, the laser power is modulated at frequencies between 10 Hz - 10 kHz. This results in a continuous change in the melt pool so that the material is redistributed, thereby generating mountains and valleys that are half above and half below the initial level. The surface layer solidifies directly from the melt, so that, in addition to structuring the surface, it is simultaneously polished. To increase the spectrum of materials that can be processed with LUST (e.g. 1.2343, Ti6Al4V, IN718, 100Cr6), Fraunhofer ILT has conducted systematic investigations on CoCr28Mo using single tracks within the project »Wave Shape« funded by the Volkswagen Stiftung.

Result and Applications

The investigations show that CoCr28Mo is basically suitable for use with LUST (Figure 2). It has also been shown, based on single tracks, that structures with a height of more than 4 µm can be generated by a single processing step. This is roughly the same structure height that can be produced with comparable process parameters on the tool steel 1.2343. Furthermore, the studies show that approx. 200 µm high wave structures (similar to 1.2343) can be generated in processing times of 2 - 3 min/cm^2. The method is suitable for producing a wide range of aperiodic and periodic structures (Figure 2, 3). The textured surfaces in this case have a small micro-roughness (Ra < 0.1 µm). Potential applications for such structures are, among others, in implant technology, for streamlined structures adapted to optimize biomechanical interactions between body and textured implant surface.

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2 Aperiodic wood grain texture CoCr28Mo.
3 Demonstration structures generated with the LUST process on CoCr28Mo.

Subject to alterations in specifications and other technical information. 06/2016.