

## LASER MICRO POLISHING OF ALUMINUM MATERIALS

### Task

The functional surfaces of components made out of aluminum materials often have to be polished. Except for a few specialized applications, three-dimensional freeform surfaces are almost exclusively hand polished owing to a lack of automated manufacturing processes. For a number of years, Fraunhofer ILT has been developing a polishing technique for steel and titanium materials using pulsed laser radiation. This technique can be used, in particular, to remove the microroughness from surfaces and increase the degree of gloss. Apart from the high machining speed, the main advantages relate to process automation and accuracy of geometry. The range of materials to which this process is suited is now to be extended to include aluminum materials.

### Method

Once the process parameters have been adjusted, the aluminum materials are laser micro polished using a suitable process gas atmosphere and a TruMicro7050 disc laser with pulse lengths in the region of  $t_p = 1 - 2 \mu\text{s}$ . Tests are being carried out on flat specimens made out of EN AW-6082 (AlMgSi1Mn) and EN AW-7022 (AlZn5Mg3Cu). Typical applications for these materials include trim and design strips (EN AW-6082) as well as blow molds for plastics processing (EN AW-7022).

### Result

Micro polishing using pulsed laser radiation reduced surface roughness for EN AW-7022 from  $R_a = 0.20 \mu\text{m}$  to  $R_a = 0.05 \mu\text{m}$ . In the case of EN AW-6082, roughness was reduced from  $R_a = 0.13 \mu\text{m}$  to  $R_a = 0.07 \mu\text{m}$ . The processing speed is approx.  $6.5 \text{ s/cm}^2$  for both materials.

### Applications

In addition to applications for trim and design strips as well as blow molds, the results can be applied wherever aluminum materials need to be polished to produce a surface finish. This includes components used in engine manufacture, lightweight construction, and in aerospace engineering.

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1 Laser micro polished surface made out of EN AW-7022.