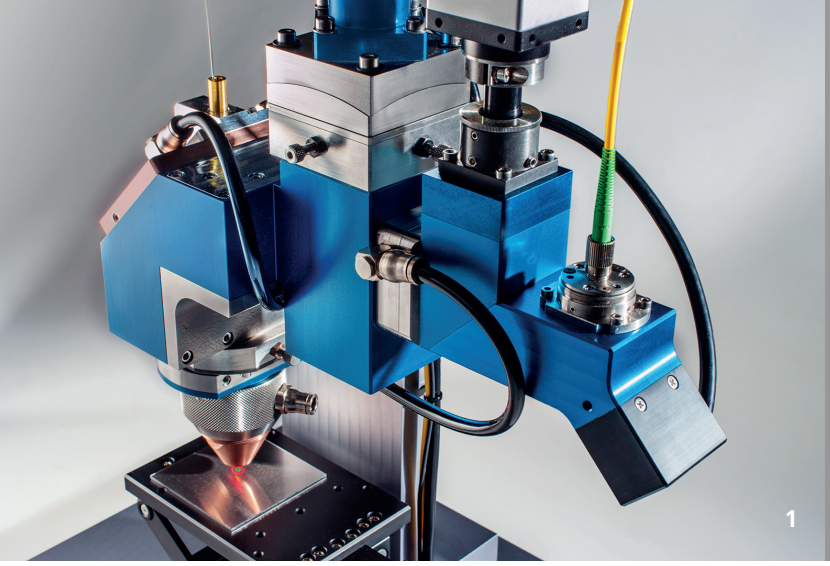

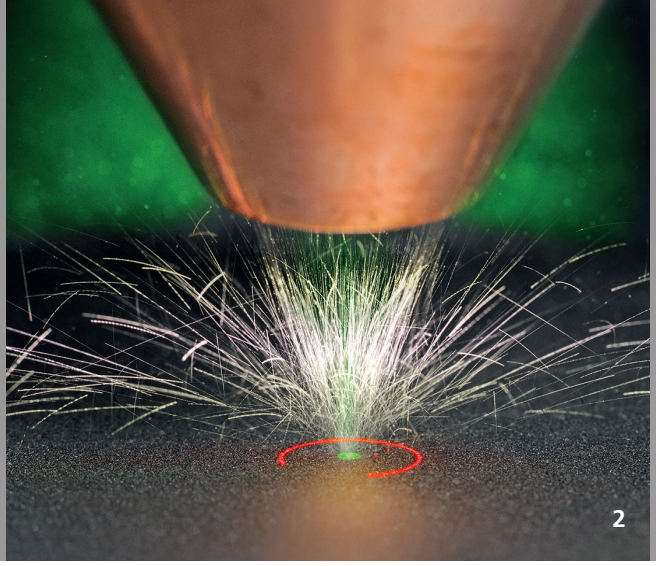

Subject to alterations in specifications and other technical information. 08/2018.

»bd-1« SENSOR FOR INLINE MEASUREMENTS DURING LASER MATERIAL DEPOSITION

Task

In laser material deposition (LMD), the production result, such as the applied track height or layer thickness, depends on various factors. Despite constant process parameters, fluctuations in material feed (wire or powder) as well as non-constant speeds at reversal points can lead to fluctuations in the layer thicknesses, which reduce the dimensional accuracy of the job. A fast control of the material feed is not yet possible. The exact knowledge of the applied layer thickness is, therefore, essential to initiate corrective action for the next tracks and layers and to increase the accuracy of the applied layers. This is especially true when the LMD is used for the additive production of large 3D structures. In addition, an inline measurement of the layer thickness can be used for quality assurance.

Method

For the direct measurement of applied track heights during LMD, powder-based and coaxial-wire-based LMD optics were supplemented with ports to connect the absolute-measuring interferometric »bd-1« sensor developed at the Fraunhofer ILT.

1 Laser material deposition with coaxial wire and »bd-1« for inline height measurement.
2 Orientation of powder focus, position of processing laser radiation (green) and measuring radiation of the »bd-1« (red).

The compact design of the »bd-1« measuring heads makes them easy to integrate into existing optics. So that the applied track heights can be measured independent of the direction, the measurement radiation is coupled coaxially to the processing radiation and deflected by mirrors around the point of application.

Results

With the developed arrangement, geometrical features – such as the layer thickness – can already be measured during production. LMD systems will, thus, be able to use the real-time measurement results in the future to immediately respond to deviations from the target geometry, preventing the accumulation of manufacturing errors. Also, fluctuating properties of precursors and materials to be processed can be detected and compensated for by autonomous parameter adjustments.

Applications

The »bd-1« sensors can initially be used in powder and coaxial wire-based LMD processes for quality assurance and later for controlling the production processes. Further fields of application for the interferometric sensor technology are, for example, in the monitoring and control of laser drilling and laser microstructuring.

Contact

Dr. Stefan Hölters
Telephone +49 241 8906-436
stefan.hoelters@ilt.fraunhofer.de

Prof. Reinhard Noll
Telephone +49 241 8906-138
reinhard.noll@ilt.fraunhofer.de

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
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