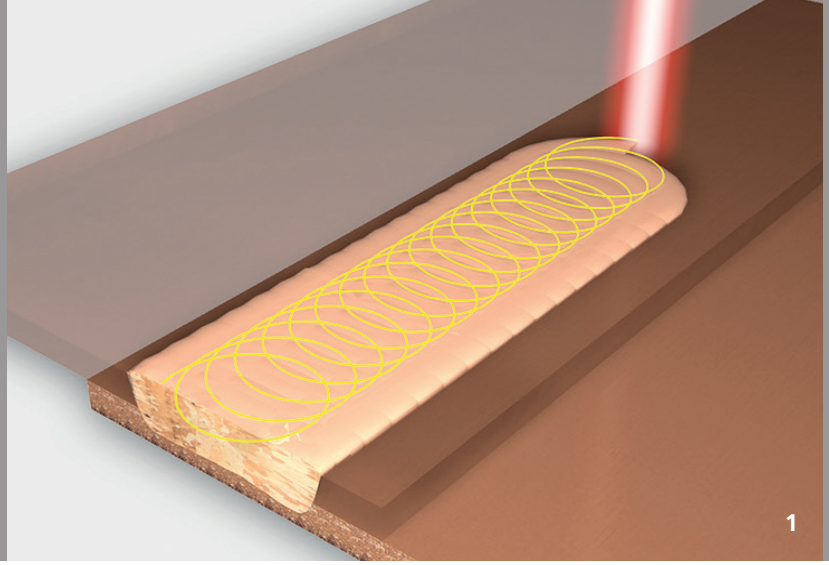

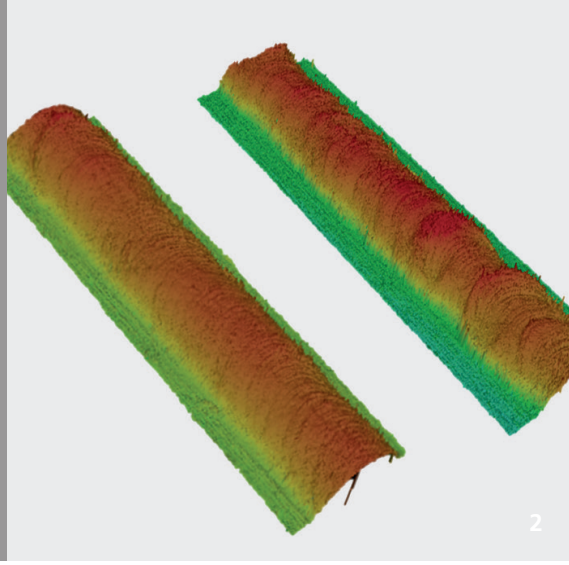

TARGETED INFLUENCE OF SEAM GEOMETRY FOR LASER-BEAM MICRO-WELDING

Task

Metallic materials are being joined by means of laser radiation more and more often since the process can be automated and delivers consistent results. Depending upon the application, the quality of the weld is quantitatively evaluated with the help of seam surface roughness, welding depth consistency or the connection area. When the energy input is spatially resolved, these quality characteristics can be influenced selectively in order to satisfy application-specific requirements.

Method

For the local power modulation, the feed movement is superimposed by an additional oscillation, which greatly extends the frame in which laser beam welding can be deployed. In addition to the parameters laser power, beam diameter and feed speed, the local power modulation has opened up other parameters to control melt pool and to selectively form both seam and structure.

Result

When local power modulation is used, the average roughness of a weld on a copper alloy can be reduced by up to 70 percent. The average roughness is a quantitative measure of the voids on the weld surface. Moreover, when the parameters are adjusted, a connection cross-section enlarged by a factor of three can be generated, in contrast to what conventional laser beam micro-welding can produce.

Applications

This laser welding technology in the fine and micro range can be found, for example, in power electronics or battery technology. The improved ways to increase the reproducibility and the targeted seam shaping can be applied to other applications such as in medical technology.

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Contacts

André Häusler M.Sc.
Telephone +49 241 8906-640
andre.haeusler@ilt.fraunhofer.de

Dr. Arnold Gillner
Telephone +49 241 8906-148
arnold.gillner@ilt.fraunhofer.de

1 Path of the laser beam during local power modulation.
2 Comparison of seam surface roughness with and without use of the local power modulation.