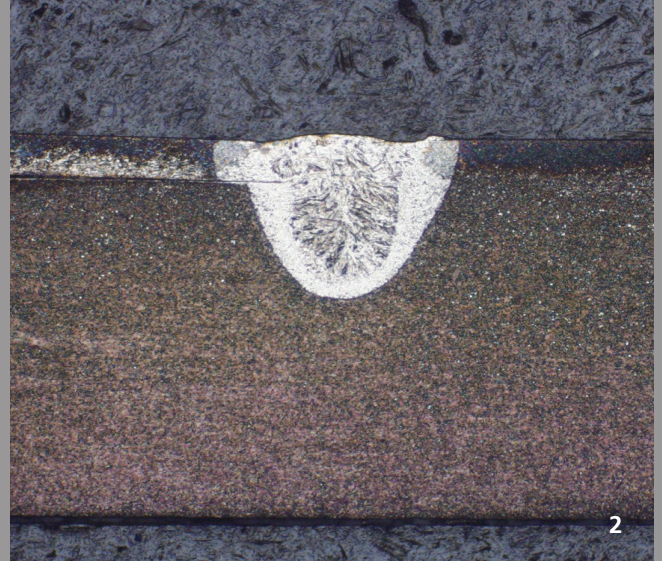


1



2

MICROWELDING OF THERMAL INSULATORS MADE OUT OF TITANIUM

Task

Titanium is commonly used as lighter and more resistant material (mechanical strength, good corrosion properties) in aerospace engineering. For example, thermal insulators are manufactured out of titanium for the assembly of various elements in satellites which must be protected against thermal effects. Here, a butt joint is used to connect a thin-walled sleeve (0.1 mm wall thickness) and a plug (6 mm outside diameter). Since these two components are produced using machining processes (such as turning and milling), the joint gap and play within two components cannot, however, be avoided.

Method

Within the scope of the project, a laser welding process has been developed to join the two elements of the thermal insulator. The main goal is to generate a stable connection and low distortion. Thanks to local power modulation, where a global feed movement is superimposed with a circular oscillating movement, weld and connection width can be controlled as well as the ability to bridge larger gaps.

Result

By selecting a suitable beam source and adjusting the joining parameters – power, feed rate, oscillation amplitude and oscillation frequency – Fraunhofer ILT can bridge the joint gap and generate a stable connection (weld depth about 300 μm , seam width about 460 μm). Gaps of up to 50 μm can be bridged reliably and reproducibly.

Applications

The results of the project can be transferred to various components in the fields of aerospace engineering and medical technology.

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1 View of the generated seam.

2 Cross-section of the generated seam.