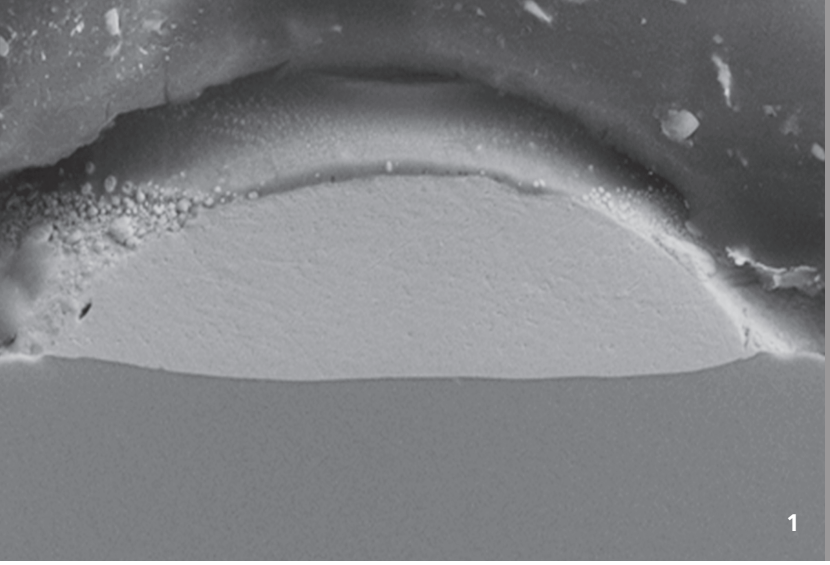
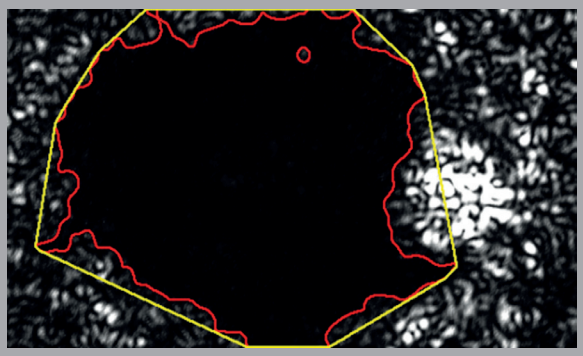


1



2

GOLD CONTACTING WITH INLINE QUALITY CONTROL

Task

Micro laser metal deposition (Micro-LMD) is a method that can generate site-selective contacts with precious metals such as gold. For the production of large quantities of the contacts, however, they need to undergo a quality control. To accomplish this, laser speckle photometry (LSP) shall be used. LSP is a method developed at Fraunhofer IKTS and based on the analysis of the temporal change of the optical speckle patterns (grained interference), which, among others, develop during thermal excitation of the test object. In a joint project of Fraunhofer Institutes ILT and IKTS, LSP shall be investigated as to its ability to indirectly determine the precious metal content and the geometry of the contacts.

Method

The gold contacts are applied by dispensing, then dried to drive off the binder and remelted by a laser. In LSP a CMOS camera is used for the necessary temporal and lateral resolution of the interference pattern. The excitation of the interference is carried out by reheating the contact with the processing laser.

1 SEM image: Cross-section of a gold contact point.

2 Graphical image analysis of laser speckle with automatic evaluation of the geometric dimensions and the gold content.

Result

Pulse processing can be used to remelt a gold contact with a diameter of about 200 µm and a thickness of several 10 µm within 100 ms. Through parallelization (e.g. by cascading beam splitting) dozens of contacts can be functionalized per second. The prerequisite is that the drying (e.g. by radiant heaters) is placed upstream in the process. The signals of LSP change with the gold content and the diameter of contacts; these signals can, therefore, be used as an indicator with appropriate calibration. The accuracy is currently around ± 7 percent. Up to 100 contacts per second can be recorded and evaluated externally, so that in principle a hundred-percent control is possible. Micro-LMD and LSP have been successfully tested in a laboratory setup.

Applications

The process can primarily be applied in electronics and electrical engineering, where electrical contacts are only required selectively (e.g. for sliding and plug contacts). Another field of application is the fuel cell industry.

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