

Jointech – Assembling setup for micro lenses

The competences of CSEM and the institute of electronics (IfE) in robotics and packaging have been used to create a new assembly setup for micro-optical components.

Motivation

The Institute of Electronics (IfE) and the Centre Suisse d'Electronique et de Micro-technique SA Alpnach (CSEM) have a common interest in the packaging and the assembly of micro-systems. One of the main innovation drivers in the industry is high-speed assembly. This cannot be achieved by only increasing the speed of the robotic systems, it requires also fast attachment processes. In this project, the competences of CSEM and IfE in robotics, packaging as well as process technologies are exploited to realize an assembly setup for micro-optical lenses.

Description

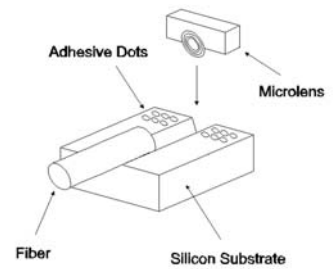
A demonstrator has been realized, which is used to assemble optical building blocks consisting of collimating lenses attached to optical fibres or fibre arrays. These building blocks are very useful elements in photonic light-wave circuits or fibre interconnects, as they can be combined with relatively little alignment precision with active or passive optical elements having collimated beam inputs or outputs. In contrast to focusing elements, which can be machined or etched directly into the optical fibre, assemblies of fibres with collimating lenses are all relatively bulky and expensive. Our discussions with companies specialized in the fibre-optics markets confirmed the need for such building blocks as versatile, low-cost elements in large numbers for the fibre-optic component markets.

In this project we assembled small collimating lenses such as novel diffractive silicon micro-optical lenses and optical fibre ends into grooves in silicon substrates. To deliver the extremely small volumes of adhesive for attaching the micro-lenses into the grooves, we employed high-precision dispensing techniques, for example micro-drop piezoelectric dispensing, and UV and/or snap thermal curing. An automated setup has been realized including dispenser, dispenser robotics and vision system to deposit predetermined patterns of adhesive material onto the silicon substrates. This setup with its control system has been built up in such way that it can be extended in a successive project to a fully automated assembly station including robotic pick-and-place operation for the micro-lenses and fibres. The joining process has also been optimized in terms of adhesive type, adhesive dispensing pattern and curing process, including thermo-mechanical simulations. The project included an optimization of the optical path for the lens/fibre assembly.

Finally, the fibre/lens assemblies will be assessed with respect to performance and reliability.

Results

The setup has been designed and is now in the realization phase. Results from simulations of the optical path indicate, that the process tolerances in terms of placement accuracy are large enough to ensure a reproducible, stable process.



Project Jointech

Project Partners
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Project Duration
9 months

Project Budget
CHF 110'000

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