Final Report Summary

Custom microlens fabrication for datacom applications

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Objective

The objective of this project was to demonstrate a process for fabrication of custom microlens assemblies that provide high fibre-to-device coupling efficiency with low optical scatter.

Background

Conjunct designs, develops and produces technology specifically for the high-speed optical datacom market. They are developing technology for low-cost optical sub-assemblies, based on a small footprint, low profile wafer-level package that is ideal for mass production using existing equipment. These packages require subassemblies incorporating micro-optics that efficiently couple light between devices (transmitters and receivers) and optical fibre, where the lens material is compatible with subsequent packaging process steps.

The LPA group at Heriot-Watt University (LPAG-HWU) have developed a fabrication process for freeform optical surfaces that offers the prospect of making these lens structures in compatible material. A key feature of this process is low optical scatter of the finished surface, providing high coupling efficiency and low crosstalk.

Progress

Conjunct and LPAG-HWU jointly reviewed Conjunct's requirements: their overall design goal, their proposed optical architectures and details of specific lens designs, with regard to the capabilities of the fabrication process and iterated to a trial set of lens designs.

HWU carried out a process evaluation for the required structures, then fabricated a trial set of lenses for evaluation by Conjunct. Optical profilometer depth maps of the lenses at HWU showed excellent conformity with design. Conjunct carried out optical tests to select the best designs, and showed that these achieved coupling efficiencies exceeding the required specification.

Based on these results, microlens arrays were designed, to evaluate the capability of the fabrication process for multichannel devices. HWU carried out fabrication and optical profilometry of these, and supplied them to Conjunct for optical testing. Optical tests showed very low crosstalk, the key parameter enabling high-performance multichannel operation.

Outcome

The project successfully demonstrated a process for fabricating high-performance microlens arrays, exceeding the demanding targets set for optical performance, in materials that are compatible with Conjunct's optoelectronic packaging process. This fabrication process is available commercially, from PowerPhotonic Ltd, an HWU spinout company. This provides Conjunct with an immediate commercial supplier for a critical component.

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