

Industrial PhD project

Research and development in materials and methods for replication of polymer/glass wafer-based micro-lenses.

Background

Kaleido Technology based in Farum, north of Copenhagen, is amongst the leading manufacturers in free-form surfaces for both moulds and moulded optical elements. At present the company is expanding its production technologies for making optical modules for the next-generation of mobile phone cameras. This project is supported by the Danish National Advanced Technology Foundation. As a result of this project an exciting and dynamic environment has evolved in the company.

The university partner in this Industrial PhD is the Department of Radiation Research at Risø National Laboratory for Sustainable Energy, Technical University of Denmark (DTU).

The Project

Kaleido Technology has many years of experience with replication of optical elements using the so-called "Wafer moulded glass optics". Based on this experience, the company wishes to address the challenges and opportunities offered by a technology known as "Polymer on glass" (POG). In particular, the potential of expanding the POG technology to new lens geometries is appealing.

Polymer-on-glass (POG) is usually based on the use of transparent moulds that makes it possible to mould polymer lenses on a glass wafer facilitated by a light curing optical polymer. This method is particularly useful for fabrication of many small lenses (\varnothing 1-2 mm) in one step. Using methods normally associated with fabrication of integrated electronics and MEMS stacking of multiple wafers facilitates the creation of lens systems. Such lens systems could, e.g., find their use in cameras for mobile phones, endoscopes and miniaturized optical sensors where high performance and low cost is mandatory.

In this Industrial PhD project, the company wishes to examine if it is possible, using POG technology, to create so-called meniscus lenses for replacing bi-convex lenses. The advantage of the meniscus lens is its superior imaging properties at low F-numbers where biconvex lenses fail.

The project will consequently focus on the correlation between the materials properties of the optical materials and the design of lens moulds. The development of materials and methods for replication of micro-lenses on glass wafers involves a number of disciplines including, optics, optical materials, photolithography and micro replication.

Resources

State-of-art equipment is at disposal at Kaleido Technology for fabrication as well as characterisation of free-form optical components. This includes, among other things ultra-precision diamond-machining systems, a 2D Talysurf profilometer and a Zygo Interferometer.

The university partner, Department of Radiation Research at Risø National Laboratory for Sustainable Energy, Technical University of Denmark (DTU), contributes with a comprehensive knowledge on light curable polymers and sophisticated process- and characterisation equipment.

Relationship with other PhD projects

This Industrial PhD project will be coordinated with an ongoing PhD project at DTU Nanotech entitled: *Research and development in alignment and bonding of micro-replicated lens surfaces on wafers aimed at producing camera modules for mobile phone cameras.*

The combination of the two PhD projects makes it possible to create a unique workflow in fabrication of micro-optical elements as it includes the three major steps: materials->components->systems integration.

The candidates' qualifications

The candidate is required to hold a M.Sc. in Physics/Chemistry preferably related to micro-fabrication and optics. The applicant is furthermore expected to be able to work independently combined with a high degree of commitment.

Additional details

The position is pending on approval from the Industrial PhD committee of the Danish Agency for Science, Technology and Innovation and registration as PhD student at the Technical University of Denmark (DTU). In order to register as PhD student at DTU an average grade of 8.2 (using the Danish 7-point grading scale) is required.

The position is limited to 3 years of employment at the Kaleido Technology.

Contact info

For further information pertaining to the position, please contact:

Christian Holme, PhD., CTO, Holme@kaleido-technology.com, direct phone +45 44 34 70 46

Lars R. Lindvold, PhD, Senior Scientist, lali@risoe.dtu.dk, direct phone. +45 46 77 49 69

Application

Please send your application to Kaleido Technology by e-mail: Holme@kaleido-technology.com.

Deadline for application is 15th of October 2009.