Novel 'Dual-Grating Assisted Directional Coupler' Developed For Nanophotonics

30 January 2006

A collaborative research project between Innos (UK R&D company) and the universities of Surrey, Southampton and the Politecnico di Bari in Italy has developed a novel method for coupling light from an optical fibre to 200nm thick silicon waveguides in optical communications. The project has demonstrated the highest recorded coupling efficiency of 55%.

"There have been several published methods of achieving an effective coupling in theory, however no grating-based coupler has achieved as high a demonstrated efficiency as the work we have completed with Innos, Southampton University and Politecnico di Bari. It is also one of the best overall published results by any other method to date," says Research Fellow at the Advanced Technology Institute at the University of Surrey, Dr Goran Masanovic.

With the ever-decreasing size of communications devices optical technologies are at nanometre scale. The control and manipulation of light at this size (nanophotonics) can affect polarisation, loss and coupling issues. One of the key issues to be solved in nanophotonics is the coupling of light between an optical fibre and a semiconductor waveguide. Due to the difference in thicknesses and refractive indices between the two structures a direct coupling currently results in a loss as high as 20dB.

Coupling further becomes a problem as optic fibres typically have a core dimension of 9µm and the dimensions of silicon devices are often reduced to improve packing density and improve the performance of the photonic circuit. This often results in cross-sectional dimensions of silicon-based waveguides of ~1µm or less.

Commenting on the project, Sales and Marketing Director from Innos, Dr Alec Reader stated, "Advances such as fast silicon modulators and silicon lasers in silicon photonics has sparked interest recently not only from academia but from world-leading companies as devices are reduced in size. Coupling is just one roadblock to producing smaller devices, and we are pleased to have helped produce such an impressive proven result. We are expecting to work with the University of Surrey again on future European and EPSRC-funded projects."

Source: University of Surrey