Short description

Lancer, “Light amplifiers with Nanocluster and Erbium” will realise a new generation of optical waveguide amplifiers and lasers in the 1.5 micron telecomm window, by using only CMOS compatible technology.

Abstract

Lancer project, “Light amplifiers with Nanoclusters and Erbium” will realise compact, high-performance, CMOS-compatible and cost-effective planar optical amplifiers and lasers for the next generation of optical networks. The drive to combine the functionality of silicon electronics with optical data transmission to yield silicon opto-electronic integrated circuits operating at 1.5 micrometers is currently a technological priority of both communication and microelectronics communities. The present project intends to exploit the quantum properties of Si nanoclusters (Si-ncs) to efficiently excite erbium ions, which are the optically active species responsible for light amplification. In this way, the project will overcome the principal problems that have precluded the development of such amplifiers to date: poor emission efficiencies of Er in silicon, small excitation cross-sections for Er in silica and the requirement of expensive laser pump sources.

The project will exploit two approaches: hybrid and monolithic integration. The hybrid approach will involve, for example, flip-chip bonding of an ion-exchanged glass waveguide with a planar Er/Si-nc codoped layer. Monolithic silicon amplifiers will be fabricated by co-doping silicon waveguides with Si-ncs and erbium ions. The devices will be electrically and/or optically pumped, the latter using a low-cost LED. Planar packaged devices with gains of 10dB less than 5cm in length are envisaged, allowing the deployment of inexpensive photonic components for metropolitan networks and fibre-to-the-home. The consortium includes universities, SMEs and research centres active in materials, technology, electronics, photonics and signal processing.

A summary of the main objectives of Lancer project is:

1) Fabrication and engineering of the materials at the nanoscale, in order to obtain suitable active materials co-doped with Si nanoclusters and with Er for photonic devices compatible with Si technology.
2) Determination of the mechanisms governing the interactions between the Si nanoclusters and the Er ions, as well as the optimum conditions for efficient energy transfer low losses in waveguides.
3) Realisation of a low cost, compact and broad band planar waveguide amplifier in the standard wavelength of 1.5 μm for high rate optical communication in the metropolitan area.
4) Realisation of a Si-based laser in the Er window.