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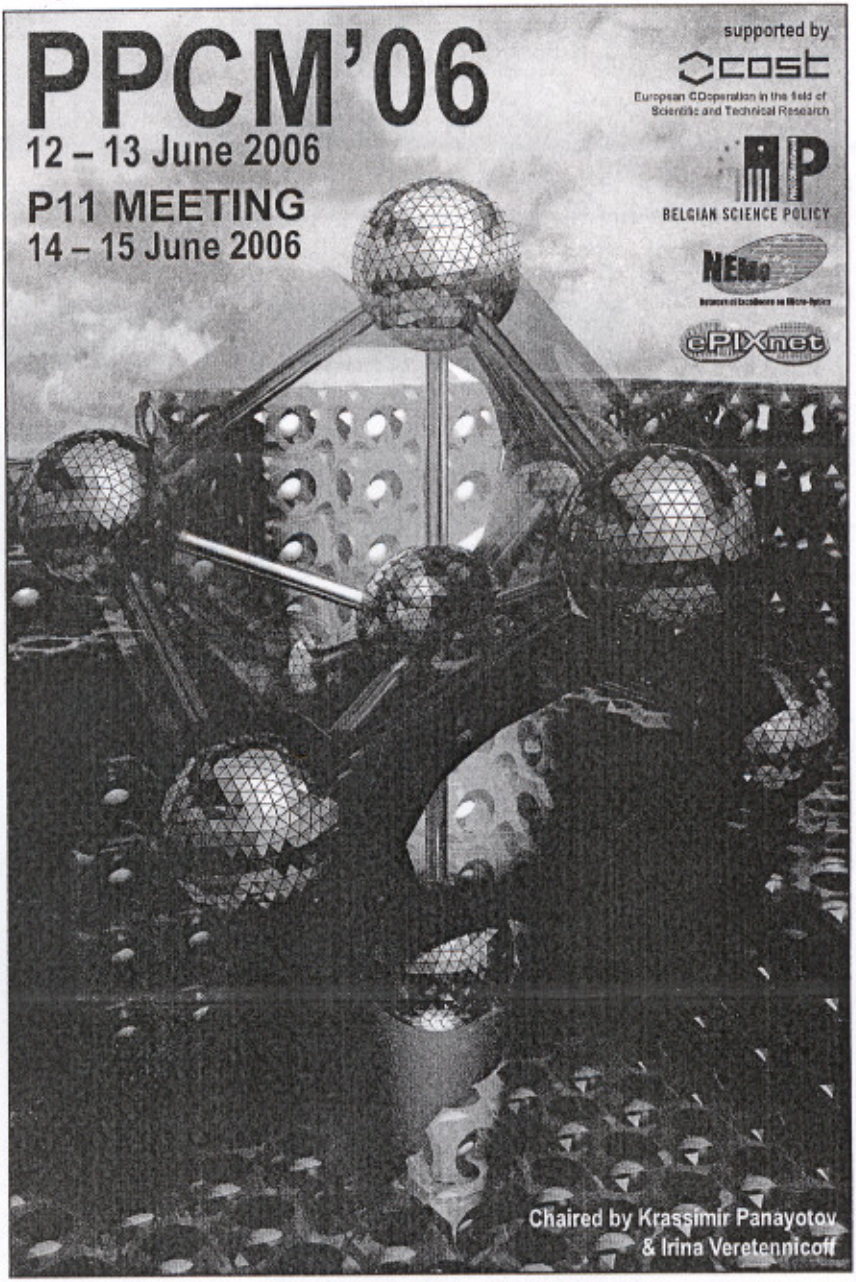

Vrije Universiteit Brussel, Brussels, Belgium

Scientific Program and Abstracts

Vrije Universiteit Brussel

High index-contrast silicon-on-insulator nanophotonics

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We will present recent progress in several devices based on silicon-on-insulator nanophotonics using deep-UV lithography. We will report on high efficiency grating couplers, ultra-compact arrayed waveguide gratings and ring-resonator based biosensors.

We have fabricated such grating couplers in SOI with a measured coupling efficiency of 69%. The gratings have a footprint of 10x10 μm^2 and the 1dB bandwidth is 40 nm. The high coupling efficiency is achieved by adding a gold bottom mirror to an existing SOI-grating coupler using BCB wafer-bonding. In this way, coupling to the substrate is avoided, and all the light can be coupled upwards by the grating. The coupling efficiency can be further increased by using a non-uniform grating to a theoretical value of more than 90%.

We also optimised and fabricated several very compact SOI arrayed waveguide gratings. Here we present a 16 channel AWG for routing purposes, with a 200 GHz channel spacing. The AWG has 36 arrayed waveguides. The gaps between the (shallowly etched) array waveguide apertures are 190nm. The device has an insertion loss of 2 to 3 dB, and a side lobe level (giving rise to crosstalk) of -15 to -20dB.

Finally, we demonstrate a sensor based on an SOI optical microring resonator with radius 4 micron. We find our device capable of detecting bulk refractive index changes of $7*10^{-5}$ using salt concentrations. The silicon surface has been chemically modified allowing for immobilization of biotin molecules. We test avidin/biotin affinity sensing by flowing an avidin solution over the modified microring using a microfluidic system and observe the corresponding resonance wavelength shift. Moreover, we demonstrate easy and alignment tolerant coupling of light into and out of our device.

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