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Sub-wavelength optical propagation in passive and active 1D-nanostructures

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In the field of nanophotonics, the understanding of optical phenomena related to sub-wavelength guiding in 1D-nanostructures is a fundamental interest for devices down-scaling. We present theoretical and experimental investigation of light propagation in original passive and active organic nanotubes. For this, polymer nanotubes has been designed and developed by the template wetting method. To characterize their optical behaviour and in particular the sub-wavelength propagation, numerical and experimental tools have been developed. Modelling phenomena propagating in these nanofibers was performed by the numerical FDTD method. The effects of the geometry of these nanotubes and nanowires have been investigated. In particular, the effect of the diameter (outer and inner diameter for nanotubes) on the propagation behaviour, (energy distribution, losses) as well as the effect of the substrate has been determined. Experimentally, two types of nanofibers were studied. First, direct injection into passive nanofibers of SU8 polymer was performed through a micro lensed optical fiber. A striking result is the assessment of optical losses measured by the cut-back around 1.25 dB/mm for nanotubes of external and internal diameters respectively 240 nm and 120 nm. This appears very competitive compared to other systems currently envisaged for integrated nanophotonics. Second, active polymer nanofibers (polyfluorene PFO) embedded in a wave guiding polymer were elaborated and appeared to be an efficient design for a nano-source.

Biography

Nolwenn Huby has completed her PhD from University of Bordeaux (France) on OLEDs fabrication and optimization. Then she performed Post-doctoral studies on integrated hybrid memories from Materials and Devices for Microelectronics laboratory in Milan (Italy). She is Associate Professor at the Optics and Photonics department of the Institute of Physics of Rennes, France, and is working on organic integrated photonics. She has published 30 papers in reputed journals.

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