Guy Stéphan, J Laser Opt Photonics 2018, Volume 5
DOI: 10.4172/2469-410X-C1-023

Polarization control in optical waveguide via chirality

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Transverse polarizations in planar optical waveguides are reduced to the two well-known linear TE and TM polarizations. As a consequence, any set-up requiring other polarizations, especially the circular polarization (chiral sensing, 3D-display, quantum optics...), cannot take the full advantage of integrated optics. Here we report on the first achievement of planar optical chirowaveguides capable of propagating any expected state of polarization. While keeping the planar geometry of the device, the planar symmetry is overcome by using a chiral material for the guiding core. We developed chiral organically modified silica (OrMoSil) based chirowaveguides using the simple dip coating technique. Their refractive indexes (RI) can be modulated by triethoxysilane doping. The polarization of the two fundamental guided modes is measured on 3 cm long waveguides. We demonstrated that the polarization can be varied from linear to nearly circular depending on the RI contrast and the core thickness. These unprecedented achievements allow additional possibilities to planar waveguides that can give rise to novel highly integrated photonic devices based on circularly polarized light propagation.

Biography

Guy Stéphan is a Professor at the ILM in the Materials and Photonic Nanostructures team. He received his PhD in Physics from the University of Lyon in 1995. His area of expertise is light matter interaction, rare earth spectroscopy, planar waveguides and chiral spectroscopies. He manages the chirality thematics of the MNP team. To date, he has co-authored 55 publications, his research in the field of chiroptic guides led to the first publication showing the control of polarization via chirality in waveguides.

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