Luminescent nanocomposites for photonic sensing

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This communications reports about a novel synthetic methodology that permits a tailored deposition of dye containing nanometric thin films over photonic structures for the fabrication of luminescent sensing photonic chips. This new procedure is based on the room temperature partial polymerization of the dye molecules in a remote Ar glow discharge. As a result of this one step solventless process a polymeric nanocomposite thin film is produced containing some dye molecules that keep intact their optical activity and sensor response. In addition this synthetic strategy permits the use of additional precursors in order to control the dye molecules aggregation and therefore modified the fluorescent and absorption response of the nanocomposite. The thin films are flat homogenous mechanically stable, insoluble and well adhered to the substrate. These materials can be processed in order to produce micrometric patterns for photonic applications. The mechanical, structural, optical and luminescent properties of the films deposited by this new procedure make such materials ideal candidates for their integration in photonic structures for environmental sensing applications. For example this synthetic methodology has been recently used for the deposition of optical NO_2 sensing nanocomposites [1] and for the controlled introduction of solid organic luminescent planar defects within self assembly 3D photonic crystals [2]. The fabrication strategy developed is fully compatible with the current micro- and optoelectronic technology permitting the use of temperature sensitive substrates and is scalable at the wafer level. Examples of the integration of the luminescent nanocomposite as active layers in photonic structures will be shown.

References:

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[2] F.J. Aparicio, G. Lozano, et al., Chem. Mater., **2** (2010) 379.