EuroSciCon

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

D Levy et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-001

SOL-GEL MATERIALS FOR OPTICAL APPLICATIONS

D Levy[2], E Castellon[1] and M Zayat[2]

[1]CIEMTEC-Universidad Costa Rica, CR
[2]ICMM-CSIC, Spain

One of the main research activities of the Sol-Gel Group at Madrid (*GSG-ICMM*) is based on a new approach of incorporating electroactive organic molecules in glasses. In other words, the possibility of manipulating the optical properties of molecules encapsulated in thin-films glasses by means of application of an external electric field. Due to their interesting optical properties, these new materials can be used in a very wide range of applications. This development consists on the microencapsulation of liquid crystal (LC) droplets dispersed in Sol-Gel glasses. The prototypes of optical switches have been developed as GDLC® (Gel-glass Dispersed Liquid Crystal). As an interesting alternative, the structure of biological templates has been also explored as a novel route for the preparation of an electro optical device from a biofilm structure created by bacterial activity. Biofilms created by live microorganisms can provide specific structures. The novel usage of the tridimensional architecture and optical properties of a biofilm created by the bacterium *Pseudomonas putida* mt-2 for the fabrication of a variable light-transmission device will be described. The bacterial cell factory is a promising non-chemical route for the generation of tridimensional structures oriented to the design of new. A new concept of an optical thin-film material that exhibits reversible humidity-responsive light-transmittance properties is presented. The novel reversible humidity-responsive light transmission thin-film material consists on a dispersive porous structure, with embedded hygroscopic and deliquescent compounds, that is able to scavenge water molecules from humid air to fill-up the pores and become transparent to the incident light. Upon exposure to dry air, water is released from the structure and the material recovers its original light scattering properties. The developed thin-films can change their transparency when exposed to air with different relative humidity (RH), adjusting the light throughput. Therefore, this material concept can be used to design new optical windows, having the advantage that they do not require liquid crystal, transparent conductive glass substrates or complex layer-by-layer architectures for operation as in conventional smart windows. The general design of the humidity-driven light-scattering device concept will be presented.

Biography

D Levy has started (1982-89) at The Hebrew University of Jerusalem, with the pioneering first application of the Sol-Gel process to the preparation of organically doped silica gel-glasses and reached the ICMM-CSIC in 1989. He was awarded the First Ulrich Prize for the most innovative work and was nominated to the Juan Carlos I Rey research award. He has authored over 133 papers (> 6800 citations; h=40, G-Scholar), reviews, book chapters, Co-Editor of The Sol-Gel Handbook, and several patents, and was PI for 27 Industry Projects. He is member of the International Advisory Board of the Sol-Gel Optics and Optoelectronics and Optical Science and Technology of the SPIE (USA), and a Member of the Experts Panel of the FP7 and H2020 Materials and Space Programs. He Chaired the XVII Sol-Gel International Conference in Madrid, 2013. He is a Professor at ICMM-CSIC heading the Sol-Gel Group (*SGG*) and his research interests are optical materials and their applications, and also headed the LINES of the INTA, where developed space materials for space optical instruments, able to be implemented on the board of a satellite.

David.Levy@icmm.csic.es