Photonic applications of Organic-Inorganic Hybrids. From direction modulated photoluminescence to IR photoactivated processes.

Dr. Sidney J.L. Ribeiro

I*nstitute of Chemistry- São Paulo State University- UNESP, 14800-060, Araraquara-SP, Brazil*

Jueves 3 de agosto, 14 horas - Aula RFP, 3er piso, DQIAQF/INQUIMAE

Resumen:

Organic–inorganic hybrids (OIH) allow the fabrication of materials with tunable attributes offering modulated properties. The synergy between the intrinsic characteristics of sol–gel derived hosts and the luminescence features of trivalent lanthanide ions leads to innovative applications. In this talk we will show OIH featuring simultaneous iridescence and light emission [1]. They are obtained through liquid crystal self-assembly of cellulose nanocrystal-template silica. The cellulose nanocrystal film structure comprises multi-domain Bragg reflectors and the optical properties of these films can be tuned through changes in the relative content of silica/cellulose nanocrystals. The incorporation of the light-emitting compounds allows a complementary control of the optical properties. The photonic structure plays the role of direction-dependent inner-filter, causing selective suppression of the light emitted with angle-dependentdetection.

In the second part of the talk we will present upconversion nanoparticles (UCNPs) containing OIH. These materials are at the core of the widespread applications in solar cells, security inks [2], biosensing [3] and IR-driven photosensitized process like Photodynamic Therapy [4], Photocatalysis [5] and nanothermometry [6]. Acknowledgements- Brazilian agencies CNPq, CAPES, FAPESP and the National Instintute of Photonics (inct.info) are acknowledged for financial support.

References

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[4]-K.Nigoghossian et al, J. Braz. Chem. Soc., 2020, 31(4), 638
[5]-S.Ullah et al, Cryst. Eng. Comm, 2017, 19, 3465
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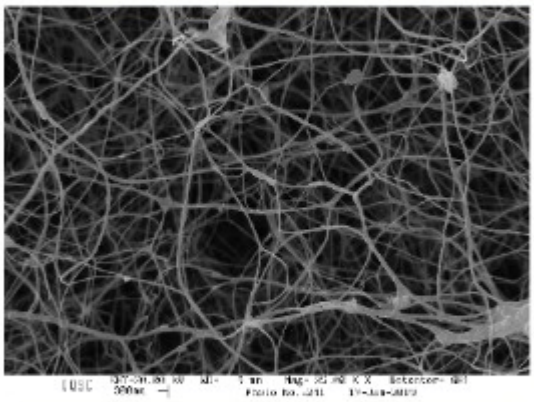
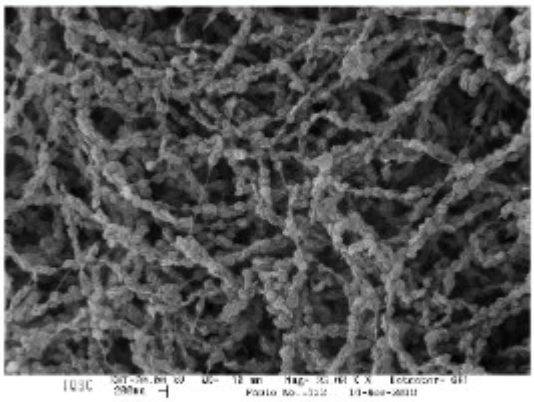
Beautiful images from Dr. Elias P. Ferreira Neto at our lab
Institute of Chemistry- UNESP-Araraquara, Brazil



Baterial celulose (BC) aerogel



MoS_2 nanoroses grown on BC aerogel fibers