Research Seminar

NUS National University of Singapore | Department of Chemistry, Faculty of Science

Photonic nanostructured biopolymers and lanthanide based nanoparticles

by Professor Sidney J.L. Ribeiro
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Host: Prof Liu Xiaogang | Fri, 28 June 2019 | 11:00 – 12:00 | S8-03-14 Executive Classroom

About Professor Sidney J.L. Ribeiro

Professor Ribeiro is a full Professor of Inorganic Chemistry at the Institute of Chemistry of the São Paulo State University (UNESP) in Araraquara-SP, Brazil. Professor Ribeiro is currently a member of the Brazilian Academy of Sciences, a member of the Academy of Sciences of the State of Sao Paulo, and a member for the European Academy of Sciences. He also currently serves as the vice-coordinator of the National Institute of Photonics, Brazil, an editor and member of international boards of some of science journals. His main research interests are in Inorganic Chemistry and its implications in Materials Science, Spectroscopy and Education in Chemistry. He has currently on-going research projects deal with natural polymers (bacterial cellulose and silk fibroin), organic-inorganic hybrids, waveguides (optical fibers and thin films), porous materials and luminescent markers for Medicine.

Abstract

Biopolymer hosts, obtained from renewable and not expensive sources have been explored together with luminescent nanoparticles aiming multifunctional photonic devices. Good optical properties, biocompatibility, remarkable mechanical properties and the wealth of chemical functionalization are the main properties of these hosts. Silk fibroin (SF), bacterial cellulose (BC) and castor oil based polyurethanes (GP) are being used in our group as a platform for multifunctional materials with applications as biosensors and photonic materials. Immunosensors have been produced by SF nanostructured layer-by-layer (LbL) films containing monoclonal antibodies against different targets like human immunoglobulin (mAbIMUG) or Taenia saginata antigen (bovine cysticercosis) and antigenic peptides like the one used to detect the antibody of the hepatitis C virus. The detection of the targets have been performed by luminescence methods together with electrochemical (cyclic voltammetry), electrical (impedance) ones. In the last case luminescent Eu3+ nanoparticles (LNP) have been used. Energy transfer from target molecules to LNP allow highly sensitive detection.

Upconversion nanoparticles (UCNP) have been widely used since the 60's of the last century in several different applications. Infrared pumping and emission spanning the UV-Vis region up to the infrared is very attractive from the technological point of view. In this presentation we will show 3 may examples where light activated processes like photodynamic therapy, photocatalysis and temperature measurements can benefit from the spectral properties of UCNP . Sol-Gel modification of surface particles will be shown to be of utmost importance concerning the different applications.