Nanostructured biopolymers platform for sensing and photonics

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Biopolymer hosts can be successfully used for fabrication of multifunctional photonic devices due to good optical properties, biocompatibility, remarkable mechanical properties and the wealth of chemical functionalization. Silk fibroin (SF) and bacterial cellulose 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.[1] The detection of the targets have been performed by electrochemical (cyclic voltammetry), electrical (impedance) or optical (luminescence) methods. In the last case luminescent Eu^{3+} nanoparticles (LNP) have been used. Energy transfer from target molecules to LNP allow highly sensitive detection. Concerning photonic applications a distributed feedback (DFB) laser was demonstrated with a SF films doped with Rhodamine 6G dye, and silica or silver nanoparticles.[2] The SF grating structure were fabricated by using commercial DVDs as templates. Results show that regenerated SF films are promising matrices for low cost and biocompatible DFB lasers.

References

1. M.L. Moraes et al, *Langmuir*, **23**, 3829 (2013).

2. R.R. Silva et al, *J. Mater. Chem.*, **1**, 7181 (2013).