# OPTICAL PROPERTIES OF SILK FIBROIN FILMS AND FLUORESCENT CARBON NANOPARTICLES

Laís Galvão Caetano[1*], Maurício Cavicchioli, Molíria Vieira dos Santos, Sidney J. L. Ribeiro

[1]*Instituto de Química – Araraquara- SP, Brazil*

*e-mail: laisgalvaoc@gmail.com

Silk proteins have been proposed as renewable resource for manufacturing films for photonic applications because of their optical transparency, biocompatibility and high mechanical strength. In this paper, we described a method to form gratting structures on the surface of silk fibroin films doped with fluorescent carbon nanoparticles using a commercial blank optical disc (DVD) as a substrate. Angle-dependent iridescent colors were produced in these materials because of the Bragg diffraction.[1] Carbon quantum dots (CQDs) are a new class of carbon nanomaterials with nanometric dimension that shows fluorescence. As a rule, the smaller the CQDs the higher will be the fluorescence quantum yield. Compared with macro-scale semiconductor quantum dots materials, they have attracted attention due to their excellent properties such as unique chemical inertness, high biocompatibility and low toxicity. Therefore, they have many potential applications in biomedical imaging, biosensing, photocatalysts, optoelectronic devices and drug delivery.[2] The CQDs synthesis proceeded via nitric acid oxidation of the powdered vegetal coal from charcoals in a reflux at 100ºC/ 12h. The doped films were prepared by adding carbon dots, dissolved in water, to the aqueous solution of silk fibroin extracted from *B. Mori* silkworm cocoons. Polycarbonate molds of 3cm Ø were fixed in the DVD recording layer and the prepared suspension was placed on its surface and dried at room temperature. After casting, the films were easily removed from the molds. These materials were characterized by UV-Vis spectroscopy, photoluminescence, FT-IR, Transmission electron microscopy (TEM), Dynamic Light Scattering (DLS), Scanning Electron Microscopy (SEM) and Atomic-force Microscopy (AFM). The separated CQDs and doped films emitted luminescence in gradient colors from blue to red under UV exposure. The emission shape has been found to be dependent of the excitation wavelength resulting in a displacement of the bands (Figure 1). TEM images of CDQs showed different size particles with diameters ranging from 2 to 24 nm and well-resolved lattice fringes with interplanar spacings agreeing with the facet of graphite. AFM and SEM images indicate that the diffraction gratings were patterned on the silk fibroin surface.

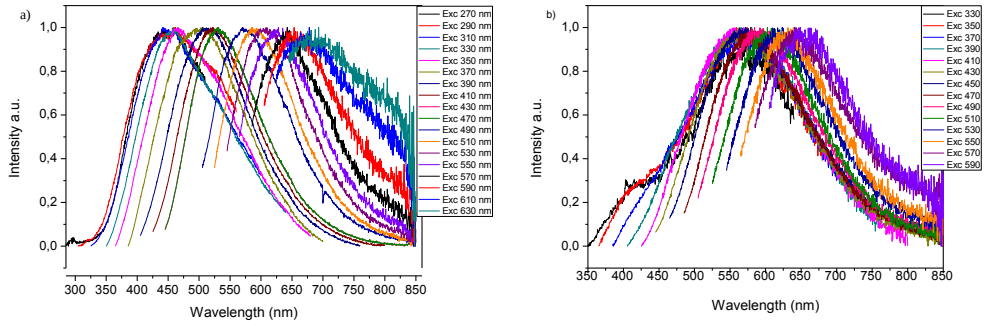


**Figura 1:** a) Emission spectrum of CQDs and b)doped films.

**References:** 1.Silva, R. R. et al. J. Mater. Chem. C/ **2013**, 1 (43), 7181-7190; 2.Du, F. et al. Nanotechnology/ **2014**, 25 (31), 1-10.