Structural study of rare earth doped silk fibroin

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Fibroin, a structural protein found in cocoons of the *Bombyx mori* [1], is a potential polymeric material for photonic applications. That biocompatible matrix is an interesting host for different ions or molecules; in addition, its tunable refractive index allows the confinement of photons and creates the biocompatible and resorbable waveguides [2], which that could be used to provide optical energy for diverse applications e.g. therapy or image of living tissues. These optical feature was consequence their mechanically robust properties, smooth surfaces, high transparence (> 95%) in the visible spectrum (Figure 1) and effortlessly moldable. Furthermore, the fibroin matrix could be easily functionalized and the physical-chemistry properties can be tunable, which that can provide a greater versatility of the proposed materials. In another way, the use of rare earth doped materials on photonics is well-known, as solid-state lasers at UV-vis NIR spectral region, light emitting devices, fibers for optical amplifier, and data storage systems. However, there are not studies about the light emission in rare earth doped fibroin, but the combination of mechanical and optical properties of fibroin with the multifunctionality of rare earth ions can be a way to carried out new and distinguished photonic devices. Finally, the present work aims to study fibroin [3] doped with different rare earth ions ($Eu^{3+}$and Tb^{3+}) for potential photonic applications. The preliminary results have shown an emission of rare earth ion associated at an antenna effect by amino acids, and distinct photophysical properties were obtained for different ions.

Figure 1: Image showing the high transparency of fibroin films doped with rare earth ions.

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