Study of energy transfer between peptides and $YVO_4:Eu^{3+}$ luminescent nanoparticles for applications in biosystems

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Spectroscopic properties of lanthanide ions (Ln^{3+}) have been explored for almost a century seeking at different applications, ranging from the creation of more efficient phosphors to devices such as light emitting screens, excited devices for different energy sources and lasers, as well as biomarkers and luminescent sensors.[1]

Using the technique of deposition Layer-by-Layer (LbL) for the preparation of a silk fibroin film containing NS5A-1 antigenic peptide and $YVO_4:Eu^{3+}$ nanoparticles was observed great sensitivity of luminescence of nanoparticles in the presence of antibody to hepatitis C virus (HCV) in solution. The extraordinary sensitivity was attributed to a very efficient energy transfer process of tryptophan residues for nanoparticles. Properties of a high sensitivity immunosensor were observed when the film was tested in the presence of anti-HCV antibody.[2] Thus, the interaction fibroin-peptide studied may lead to new architectures immunosensors based on several antigenic peptides and/or monoclonal antibodies using silk protein as an array of suitable immobilization.

New peptides are being studied in nanostructured films fibroin silk for use in biosensors prototypes. One of these peptides, Hylina, has a chain of 18 amino acid residues, where the leucine residues can be replaced by tryptophan residues, besides allowing the addition of different charges at the N-terminal region, changing the structure of this peptide.[(5)] Thus, we are evaluating the influence of peptide structure, number and position of tryptophan residues in luminescence of $YVO_4:Eu^{3+}$ and $YVO_4:Tb^{3+}$ nanoparticles. The growth of the films was monitored by UV-visible spectroscopy, and further characterized by Luminescence spectroscopy and Circular Dichroism spectroscopy (CD).

References:

1. Chem. Rev., 110, 2729-2755, 2010.
2. Langmuir, 29, 3829 - 3834, 2013.
3. Biopolymers, 96, 41-48, 2011.

FAPESP, CAPES and CNPq.