Image and emission spectrum of luminescent nanostructures

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Microscopy systems have evolved over time, starting with Leweenhook's inventions up to the Nobel Prize in Chemistry in 2014, where it was shown that it is possible to exceed the diffraction limit (200 nm) [1, 2]. One of the systems that have enabled this progress has been the development of lasers, which allow us to perform scans with different wavelengths.

The images presented in this work were obtained using an Optical Laser Scanning system. Scanning is performed with a laser beam (375 nm) through a 100X microscope objective, and the sample is in an XY translation stage (~ 20 nm by step). The dispersion and emission of the light coming from the sample are collected in a detector, with this information the image and the emission spectrum are obtained.

With this prototype, various sample types have been studied, such as cancer cells, the distribution of luminescent nanoparticles, etc., but this work presents images and spectra emission of nanostructures luminescent of europium ions in the KBr matrix. These optically active ions formed second phases within the single crystal, and it was observed that the emission spectra change according to the shape and size of the nanostructures [3].

Once we obtain the image of the sample, it is passed through filters that allow for improving the quality of the image. Later, using a program named Gwyddion we can convert the 2D image to a 3D to have a representation of the sample and know its height by comparing it to something known. This prototype is still in constant improvement.

[1] Leonhard Möckl, Don C. Lamb and Christoph Bräuchel, *Super-resolved Fluorescence Microscopy: Nobel Prize in Chemistry 2014 for Eric Betzing, Stefan Hell, and William E. Moerner,* Angew. Chem, Int. Ed. 53, (2014).

[2] Blom H, Brismar H, *STED microscopy: increased resolution for medical research?* J Intern Med, 276, 560 – 578, (2014).

[3] Elsi V. Mejía-Uriarte, *Solid State Commun*. 149, 445 (2009).