Nanofabrication and microscopies based on focused electron / ion beams for applications in nanosafety

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In the present contribution, we will highlight the relevance of focused electron and ion beams for applications in nanosafety. We will first introduce the capabilities of dual beam FIB-SEM (Focused Ion Beam – Scanning Electron Microscope) equipment for nanofabrication and for advanced microscopic characterization of materials and devices, which can be in particular applied to nanosafety. One example of such devices is a gold nanohole array [1], depicted in Figure 1. In this device, the light transmission can be tuned as a function of the wavelength by choosing appropriate dimensions of the holes. This device can be eventually used for label-free detection of toxic molecules absorbing light at wavelengths that coincide with those transmitted by the nanohole array. In the second part of the talk, examples will be provided in which nanoscale imaging with focused electron / ion beams provide useful information on materials relevant for nanosafety, including their nanoscale three dimensional (3D) structural and compositional characterization.

References

[1] S. Sangiao, F. Freire, F. de León-Pérez, S. G. Rodrigo and J. M. De Teresa, Nanotechnology, 27 (2016) 505202

Figures

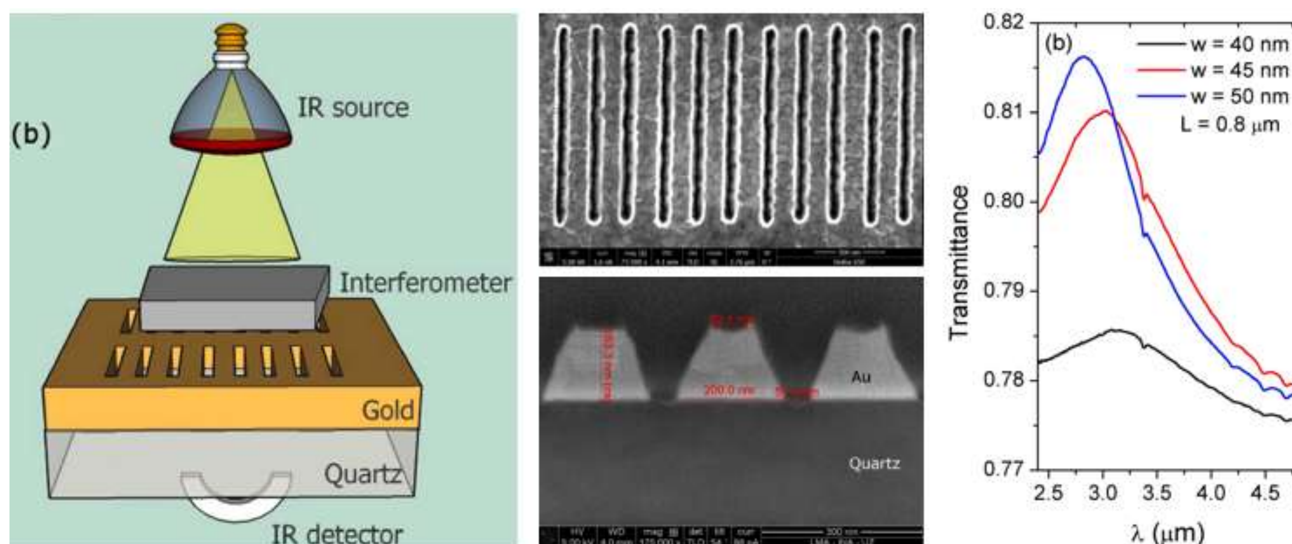

Figure 1: Left: Setup for the measurement of light transmission in the infrared regime **Middle:** Nanofabrication by electron-beam lithography of a gold-based plasmonic device with *Extraordinary Optical Transmission* **Right:** Measurements of the light transmission as a function of its wavelength