

Tuesday, 25<sup>th</sup> October, 12.00pm

**Seminar Room**

*Host: Prof. Luis M. Liz-Marzán*

## Turning infrared into visible light with molecular devices

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Frequency conversion plays an essential role in electromagnetic signal processing by allowing detection and modulation of signals that are in a frequency band where suitable technologies are not widely accessible. A prominent example is that of electromagnetic waves in the infrared range. Their detection and processing remain a technological challenge despite their great interest for molecular analysis of gases, chemicals and biological tissues.

In this seminar I will present a novel approach, combining well-studied absorption and Raman scattering of molecular vibrations inside nanocavities, to the detection of infrared waves. At the core of this approach, a doubly resonant nanostructure tailored to concentrate infrared and visible light fields simultaneously on the same collective molecular vibration. The nanostructure we fabricated demonstrated enhancement of the frequency conversion process by 13 orders of magnitude and enabled the observation of coherent conversion from infrared to visible with CW light sources for the first time.

Leveraging on these first results, I will suggest several routes to optimize the conversion process, with applications both in vibrational spectroscopy and infrared imaging, and, more fundamentally, to push infrared light-vibration coupling and optical detection towards the single-molecule limit.