SEMINAR: Nanomechanical Photothermal Sensing

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12:00 to 13:00
Seminar Room

Room-temperature optical absorption spectroscopy is a powerful tool for material identification and characterization. Over the last decade, increasing efforts have been devoted to extending absorption spectroscopy to the detection of individual molecules and nanoparticles. However, conventional approaches still face significant challenges in achieving the sensitivity required to probe a single absorber. Nanomechanical photothermal sensing has recently emerged as an alternative spectroscopy platform, offering a highly sensitive, label-free, and broadband approach that addresses some of the limitations of state-of-the-art optical techniques. In this scheme, optical absorption induces photothermal heating of a nanomechanical resonator, which is detected through the resulting shift in its mechanical resonance frequency.

In this talk, I will present my work on nanomechanical photothermal sensing, discussing the current state of the art, the main challenges limiting its performance, and future perspectives. In particular, I will focus on three aspects: (i) the capabilities of state-of-the-art nanomechanical photothermal spectroscopy, illustrated through a case study on individual gold nanorods; (ii) our current understanding of the fundamental factors governing sensor performance; and (iii) the use of this approach for the characterization of photonic materials, including the effect of mechanical stress on their optical absorption.

Finally, I will briefly introduce our latest results on infrared and terahertz detection with nanomechanical resonators and compare their performance with other state-of-the-art detector technologies.

Hosted by: Adrian Bachtold