Photothermal analysis with nanomechanical resonators

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With quality factors (Q) of several millions and good optical properties, nanomechanical silicon nitride (SiN) resonators have become widely used in fundamental and applied research particularly in the field of optomechanics. In addition to the high Qs, SiN resonators are highly temperature sensitive and we have shown μK temperature resolution. In this talk I present the photothermal analysis of nano-scale samples by making use of the high temperature sensitivity of SiN strings. Airborne species are collected on the string with an efficient non-diffusion limited sampling technique. The collected sample is then probed with light. The sample wavelength specifically absorbs energy and transfers the photothermal heat to the string which results in a measurable frequency detuning. Probing the sample with infrared light allows the recording of the sample's chemical fingerprint (IR absorption spectrum). We further show that such SiN resonators enable the analysis and mapping of single nanoplasmonic hot spots.