OPTICAL RESPONSE OF TUNABLE MICROCAVITY LASER SYSTEMS

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We are developing a scanning near-field optical microscope (SNOM) to investigate the local optical properties of polymer films doped by organic dyes or nonlinear molecules. We now want to improve the system to investigate the properties of a tunable microcavity system in a Fabry-Perot geometry [1]. While these cavities are widely studied for their original properties in cavity-enhanced spectroscopy and optomechanical coupling of the optical resonance and the mechanical resonance of the cavity mirrors, our interest lies in the their use as optical cavities for laser emitters.[2].

The laser microcavity is constituted by a reflective substrate over which we position a micrometer-size reflective surface in the shape of a plateau-tip SNOM probes. Optical amplification is provided through the deposition of a dye-doped polymer film on the substrate. The use of a SNOM configuration provides multiple advantages : collection-mode SNOM provides a perfect geometry for the detection of the emission associated with the substrate/probe microcavity.: moreover the piezoelectric positioning of the probe allows us to control the cavity length and to leverage the SNOM feedback control loop to stabilize the emission wavelength. Additionally, scanning the surface provides a constant replacement of active material, as is usually done in cw dye lasers.

We look for a candidate with a basic knowledge of optics to study the emission properties of these laser systems. In addition to studying the spectral properties and tunability, we want to investigate if the strong coupling between the optical emission and the mechanical oscillation can destabilize the output and give rise to irregular dynamics.

[1] Greuter et al. Appl. Phys. Lett. **105**, 121195 (2014)

[2] Schutte et al. Appl. Phys. Lett. **92**, 163309 (2008)