Bar Ilan University , Optics Seminar

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Electro-optically based liquid mass sensor using resonating micro-plate under harsh drop and spray conditions; efficient parametric excitations of SOI micro-beams excited by fringing fields

Abstract:

We performed in-situ sensing of volatile droplet and spray liquid mass using plate-like micro-resonator plates with low compressive stress, where robust and reusable operation over harsh conditions and multiple cycles was proven. A home-built electro-optical motion sensing system in ambient conditions was been used. The bimorph effects on the resonant frequency of altered mass loading, elasticity and strain have been compared, and the latter were found to be negligible in the presence of non-viscous liquids deposited on top of the devices. In resonant mode, the loaded mass is estimated from measured resonant frequency shifts and interpreted from simple (uniformly deposited film) model.

A minimum sub-ng detectable mass has been estimated, suggesting the potential for fast and reusable sensing capabilities of volatile liquids under harsh operation conditions.
We also describe very efficient parametric actuation in electro-statically excited single-layer microresonators, which can be employed in future integrated surface material sensors (for both liquid and vapor environments)

Refs: [1] submitted, IEEE Journal of Selected Topics in Quantum Electronics special issue on optically based sensors (2014)
[2] J. Appl. Phys. 113, 163508 (2013)