APPLIED PHYSICS LETTERS **102**, 203502 (2013)

Pressure-sensing based on photothermally coupled operation of micromechanical beam resonator

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(Received 11 March 2013; accepted 8 May 2013; published online 20 May 2013)

Here, we demonstrate the pressure-sensing scheme based on the photothermal effect in the miniaturized beam resonator in the moderate pressure range. Since the resonance frequency of the small beam resonator under thermal stress can be easily modulated by the convective cooling of the gas molecules, the pressure change has been monitored by tracking the frequency shift under constant optical power. Our experimental measurements as well as the analytical model show that the described technique ensures the fast response to the external pressure variation with high responsivity as well as much sought-after scalability, desirable for many technological applications. [http://dx.doi.org/10.1063/1.4807667]