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Graphene as a Platform for Hybrid Optomechanical Devices VINCENT BOUCHIAT, ANTOINE RESERBAT-PLANTEY, DIPANKAR KALITA, LAETITIA MARTY, OLIVIER ARCIZET, NEDJMA BENDIAB, Neel institute, CNRS-Grenoble — Graphene is known for providing a flat 2D material with outstanding optical, electrical and mechanical properties. We propose to take advantage of all three features by developing an optomechanical platform based on cantilevers made of freestanding multilayer graphene connected to an electrode. In this talk I will present several examples of a simple optomechanical systems involving a multilayer graphene suspended cantilevers that can act as a mirror closing an optical cavity. By varying the gate voltage applied on the mirror, its angle can be adjusted on a wide range (exceeding the wavelength of the incoming light) and its motion can be actuated and followed in real time from DC up to the tens of MHz range. Detection of elastic and inelastic scattered light can be performed. It allows simultaneous detection of motion, local stress and temperature of the membrane. A fully spectral detection of NEMS resonance is presented (1) and allows a novel optomechanical scheme based on coupling between motion and light through the dynamic mechanical stress. Further applications are presented as well such as a gate tunable enhancement of the Raman signal of molecular species adsorbed on the graphene platform. (1) Reserbat-Plantey, A., et al, Nature Nanotechnology, vol. 7, 151-155. (2012).

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