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Parametric resonance based mass sensing under ambient and liquid conditions GYAN PRAKASH, JEFFREY RHOADS, ARVIND RAMAN, RONALD REIFENBERGER, Birck Nanotechnology Center, Purdue University, W. Lafayette, Indiana, 47907, USA — The parametric excitation of a cantilever for AFM applications using a closed-loop electronic feedback has been previously discussed [1, 2]. The parametrically excited cantilever enables the detection of small frequency shifts due to its sharp, controllable and non-Lorentzian resonance peak, making it a suitable detector for mass sensing applications. By attaching a small particle of hygroscopic material at the free end of a cantilever, the mass can be controllably changed as the humidity is varied. The increase in mass due to the adsorbed water causes a small downshift in the resonance frequency of the cantilever that can easily be detected because of the narrow resonance peak under parametric excitation. Using a commercial cantilever, the smallest mass change observed is of the order 1 x 10^{-12} grams under ambient conditions. Efforts to extend this work to improve dynamic sensing under liquids will also be described.

[1] M. Moreno-Moreno *et al.*, Appl. Phys. Lett. **88**, 193108 (2006).
[2] G. Prakash *et al.*, Phys. Rev. B, **79**, 094304 (2009).

Gyan Prakash
Birck Nanotechnology Center, Purdue University,
W. Lafayette, Indiana, 47907, USA

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