Poster

NANOELECTROMECHANICAL CHARACTERIZATION OF PIEZOELECTRIC MICROCANTILEVERS

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In this paper, our recent results in the simulation, electrical and interferometric characterization of piezoelectric beams will be reviewed. A systematic impedance analysis of the resonance response obtained from ZnO and AlN piezoelectric cantilevers, comprising both experimental and simulation works, has been carried out. The approach is based on both impedance and laser Doppler interferometry measurements with picometer resolution, and supported by Finite Element computational analyses. The experimental results obtained by the two different techniques agree reasonably well, as the position of the resonances in the spectrum is concerned. Although non-fundamental modes are less used in sensing applications [1], they are emphasized in this work (figure 1). The characterization of some non-fundamental modes, torsionally shaped, reveals an unexpected behaviour that should be known and understood previously to any gravimetric sensor design using torsional modes [2]. An explanation to this phenomenon, based on the redistribution and cancellation of surface reaction charges, is given in detail and supported by simulation results (figure 2).

References:

[1] Søren Dohn, Rasmus Sandberg, Winnie Svendsen, and Anja Boisen. Applied Physics Letters, **86**, (2005) 233501.

[2] Javier Vazquez , Pablo Sanz, Jose Luis Sanchez-Rojas. Sensors and Actuators A, **136** (2007) 417**.**

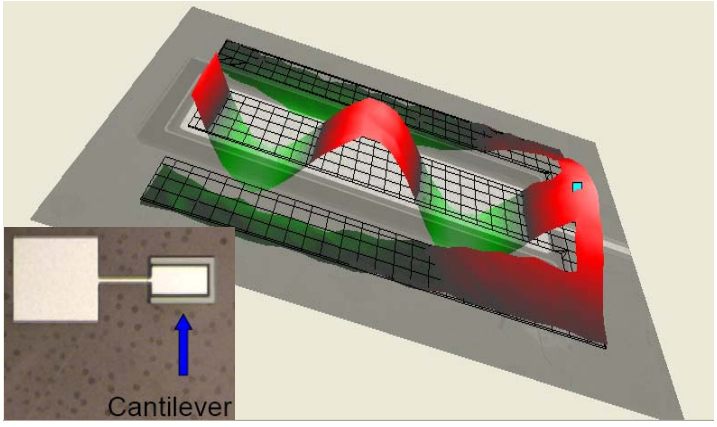

Figure 1: Measured harmonic response in displacement for excitation resonant with a high order mode of the cantilever.

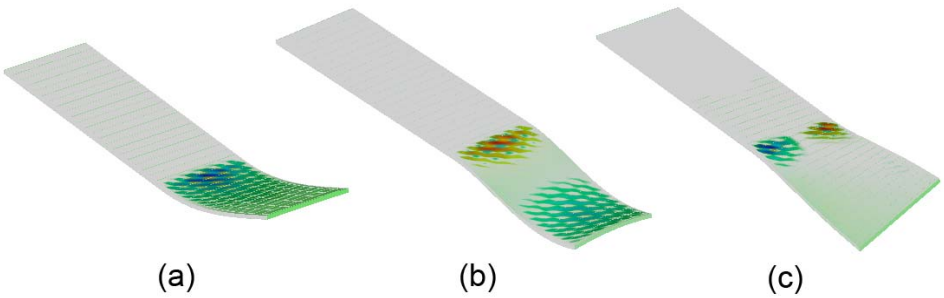

Figure 2: Imaginary reaction charge of the three first resonances of the AFM tip. Red colour represents positive charge and blue colour represents negative charge. (a) 1st resonance. (b) 2nd resonance. (c) 3rd resonance.