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Ultrafast Stroboscopic Optical Interferometry of Nanoelectromechanical Devices in Damping Pressurized Gas Environment O. SVITELSKIY, V. SAUER, N. LIU, K.M. CHENG, M.R. FREEMAN, W.K. HIEBERT, University of Alberta Physics Dept and National Institute for Nanotechnology, Edmonton AB Canada — A broad range of prospective applications of nanoelectromechanical devices necessitates understanding their performance under varying external conditions. We report a comprehensive gas damping study of a series of Si nanobridges and nanocantilevers with thickness of 0.147 μm, widths ranging from 0.1 to 1 μm, and lengths from 0.5 to 12 μm. Free ring-down oscillations of the resonators, capacitively excited by 1 ns 50 V electric pulses, were measured via instantaneous optical interference pictures snapped by a femtosecond laser. The devices response to a range of damping environments was studied, including response to different gases (He, N_2, CO_2) in widely ranging pressures from deep vacuum up to 200 bar, all done in a specially designed scanning optical microscopy chamber [1]. The resonator parameters demonstrate three distinct regions of pressure behavior: high vacuum, free molecular flow, and viscous. For each region a qualitative model is presented.
[1] O.Svitelskiy et al, Rev.Sci.Instr,**79** 093701, 2008

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