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Simulation of Heating in Nano-Electro Mechanical (NEMS) Bridges ELHAM MAGHSOUDI, MICHAEL MARTIN, Louisiana State University — Heat transfer in a thermally actuated doubly clamped bridge is simulated using a Finite Difference Method. These results are used to investigate the effect of convective cooling on the mechanical response of the system, defined as the displacement. The system is a doubly clamped beam with a length of 10 microns, a width of 1 micron, and a thickness of 300 nanometers, in air with a pressure from 0.01 Pa to 2 MPa. Conduction along the beam as well as convection between the beam and the gas are considered. A constant heat load is applied to the top of the beam. Both free molecular and continuum approaches are considered to define the convective coefficient. Simulations are performed for three different materials: silicon, silicon carbide, and diamond. The numerical results show that the displacement and the response of thermally actuated nano-scale devices are strongly influenced by ambient cooling. These results are scaled using the Biot number. The mechanical response of the system depends on the material properties and the Biot number.

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