Platinum Hotplate on Thermoisolated Polyimide Membrane as Perspective Device Used in MEMS

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Abstract. This study deals with simulation and characterization of the vibration modes for the Pt hotplate on Polyimide (PI) membrane prepared by RIE etching into the Si substrate. Mechanical simulations using a FEM (Finite Element Method) were performed on the Pt hotplate. Natural frequencies of PI membrane for the first three modes were found. Extracted natural frequencies for pre-stressed PI membrane varied from 63.5 to 104.11 kHz for the first 3 modes. Residual stress of a fabricated structure on PI membrane in steady state was σ = 179 MPa. The calculated values of stress on the surface of Pt hotplate in operational temperature of 350°C were from 34 to 158 MPa depending on the location in the structure. Mechanical properties of fabricated Pt hotplate were studied by Laser Doppler Vibrometer (LDV) to determine the natural frequencies.