Design and Fabrication of Piezoelectric Coupled MEMS Resonators

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Abstract

- We fabricated weakly coupled clamped-clamped beams and cantilevers with platinum electrodes and aluminum nitride piezoelectric layer.
- We studied the resonance frequencies of clamped-clamped beams.
- We studied the influence of geometric parameters on coupling strength and compared with FEM modeling results.

Fabrication

- Lift-off bottom electrode and seed layer
- Deposition and patterning of AlN and top electrode
- Patterning and release of coupled resonators

Characterization

- The in-phase and anti-phase first mode resonance frequencies were studied.
- The coupling constant can be calculated as equation shown below:

\[
\kappa = \frac{K}{K_{\text{in}} - \frac{f_{\text{in}}^2}{2}}
\]

Conclusions

- The measurement results of coupling constant show the same trends with simulation results.
- Increasing the beam length, width and gap can decrease the coupling strength, and decreasing the coupling beam width or putting the beam at vibration nodes can also achieve this goal.

References: