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Surface Micromachined Ferroelectric MEMS Devices: Correlating Device Performance with Film Microstructure[1] JENNIFER RUGLOVSKY, MATTHEW DICKEN, KENNETH DIEST, MOHAMED EL-NAGGAR, SHARLOTTE BOLYARD, DAVID GOODWIN, GURUSWAMI RAVICHANDRAN, KAUSHIK BHATTACHARYA, HARRY ATWATER, California Institute of Technology — The realization of free-standing ferroelectric thin film devices compatible with CMOS processing is a priority in achieving sophisticated MEMs systems. To release an active film from a silicon substrate with a back-etch technique requires the removal of hundreds of microns of the substrate as well as a suitable and robust mask for the device layer. A more flexible and process compatible technique is surface micromachining. We present work utilizing a XeF_2 etch process for surface micromachining silicon with a resistant patterned oxide layer to create free-standing ferroelectric MEMs structures. With surface patterning, we are able to realize both bridge and cantilever geometries. Lead titanate thin films grown by MOCVD for the active layer will be discussed. The devices have been synthesized in three different thin film microstructures: 1) poorly oriented, 2) fiber textured, and 3) biaxially textured. The realization of such a continuum of microstructures allows the switching mechanism to be better resolved and for the correlation between macroscopic device performance and microscopic properties to be more fully understood.

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