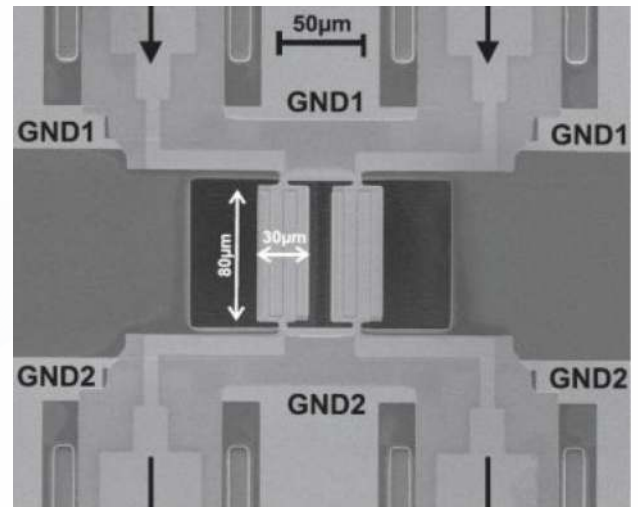


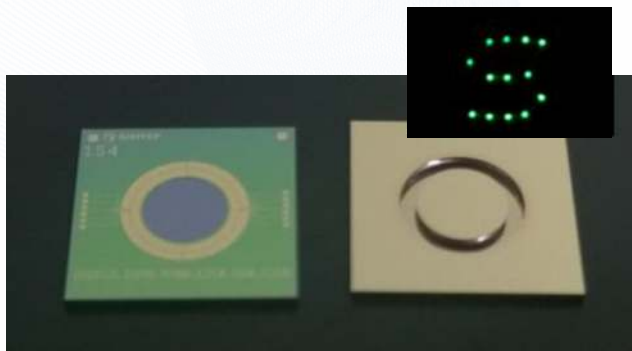
PZT for thin film piezo MEMS

Solmates Pulsed Laser Deposition process:

- High density $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$ (PZT) thin films
- Uniform deposition on wafers up to 200mm diameter
- High piezo performance as deposited, no poling or post anneal required
- High yield, stable performance, low fatigue
- Nucleation on metal, oxide or nitride thin film electrodes
- Successful demonstrators in acoustics, optical strain modulators, RF-MEMS, energy harvesters, micromirrors, and others

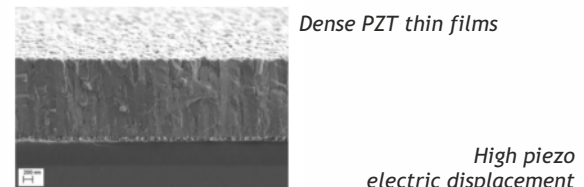


PZT - MEMS resonator for RF bandpass filter.
Yagubzade et al. (APL 2013)

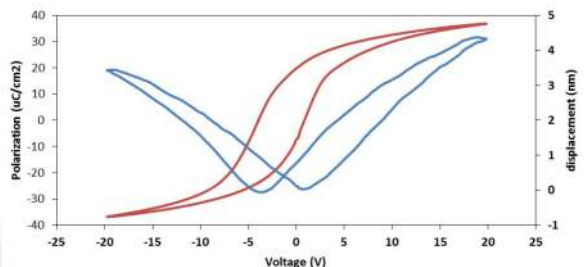


PZT - MEMS micromirror

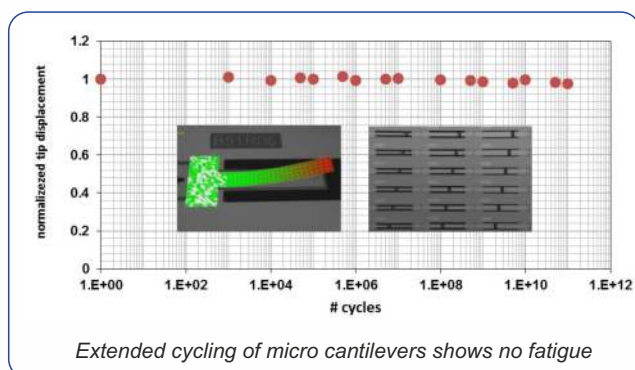
Courtesy of Sintef - Minalab



Dense PZT thin films



High piezo electric displacement



Extended cycling of micro cantilevers shows no fatigue

PZT process performance

Thickness uniformity	< 2% 1σ
Dep. rate (200mm)	> 25 nm/min
d_{33}	> 170 pm/V
$-e_{31,f}$	> 18 C/m ²
Breakdown	> 800 kV/cm

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