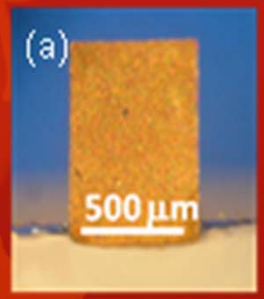
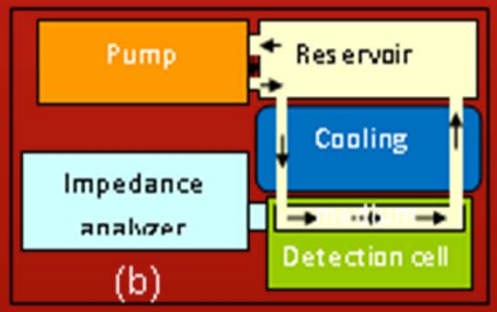
Inexpensive, Rapid, Multiplexed, and Accurate CDI Test Solution…

Piezoelectric Plate Sensor (PEPS) Array



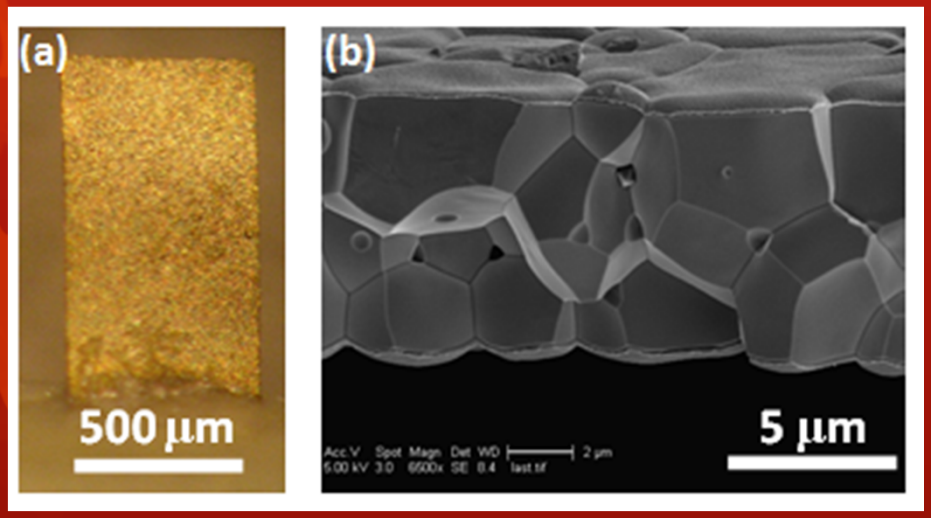


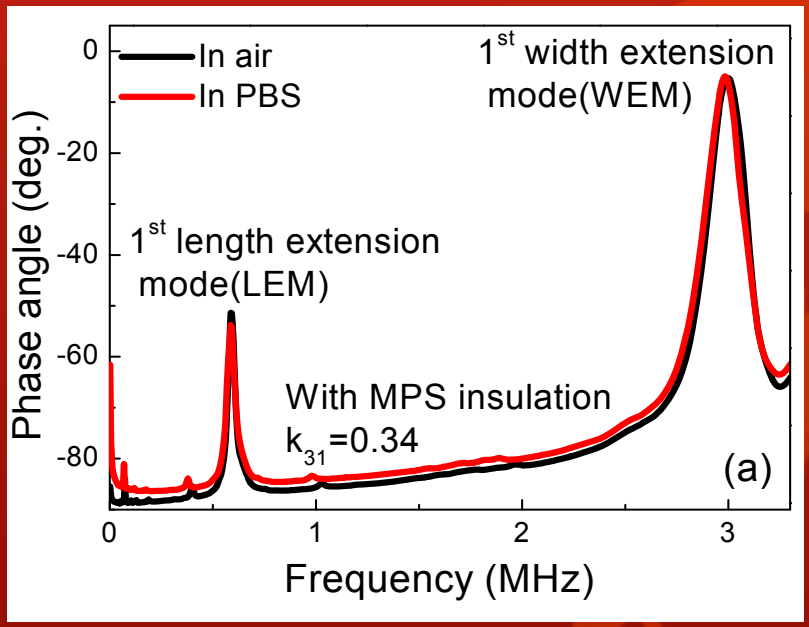
- Rapid, sensitive, and yet low-cost detection using PEPS with
  - *in situ* bacteria lysing,
  - *in situ* DNA release,
  - *in situ* DNA denaturing,
  - *in situ* DNA detection All in 40 min

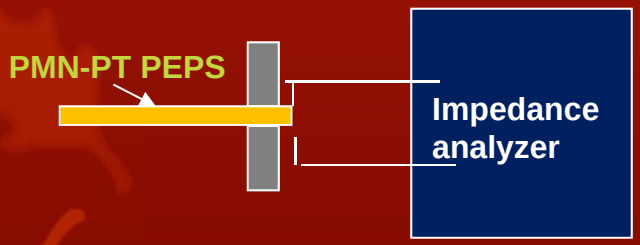
- With PCR-like sensitivity but no DNA extraction, concentration, and amplification
- Real-time genetic detection using array piezoelectric plate sensors (PEPS) with a $500 impedance analyzer

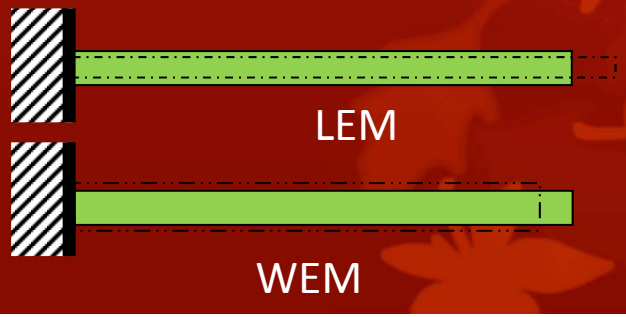
PMN-PT piezoelectric plate sensor (PEPS)

PMN-PT PEPS: (1) 1 mm x 0.5 mm made
(2) made of PMN-PT freestanding film 8 μm thick
(3) operated at length extension mode (LEM)
or width extension mode (WEM)



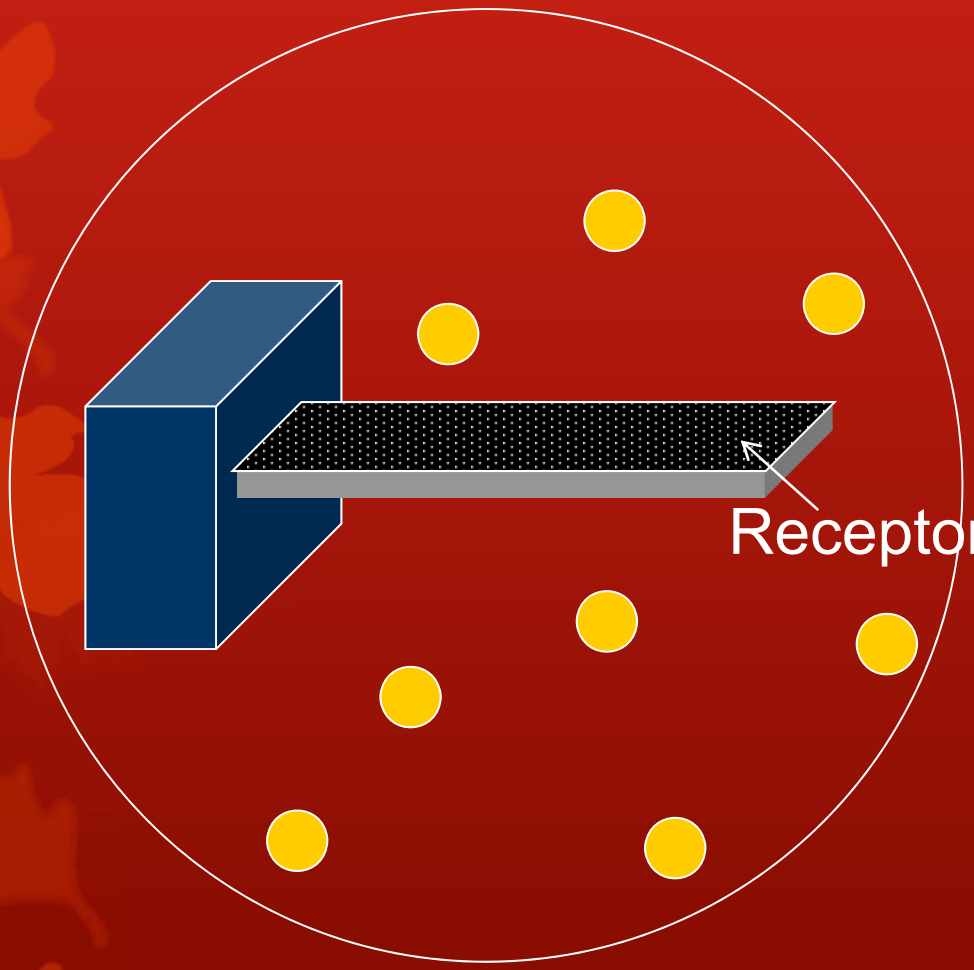


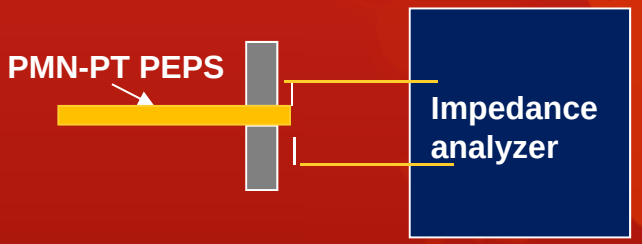


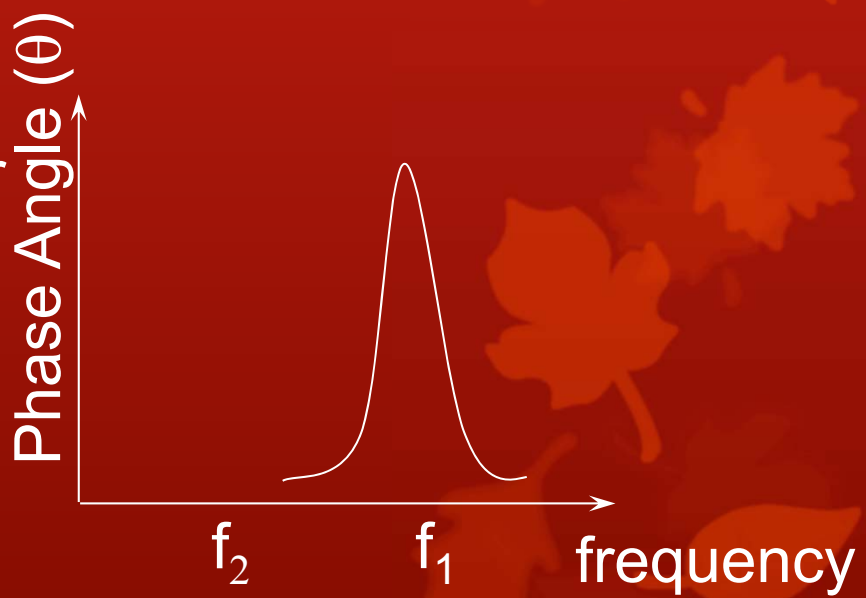


PMN-PT Piezoelectric Plate Sensor (PEPS)

Rapid, Label-Free Sensing







Target antigen/analyte

- WYS and WHS have worked on PEPS and its predecessor, PEMS
  - For more than 15 years
  - with more than $4M federal/state funding
  - more than 10 PhD theses
  - 10 patents/patent applications
  - more than 40 published journal papers
- The piezoelectric-material and sensor development is ripe

1000 times Self Enhancement of Detection Δf/f

- Due to crystalline orientation switching in “thin” PMN-PT layer induced by binding stress---No such enhancement in other piezoelectric sensor (QCM, SAW…)
- The enhancement increases inversely with a decreasing thickness
- Enhancement is further amplified in DNA detection due to the highly negatively charged nature of DNA