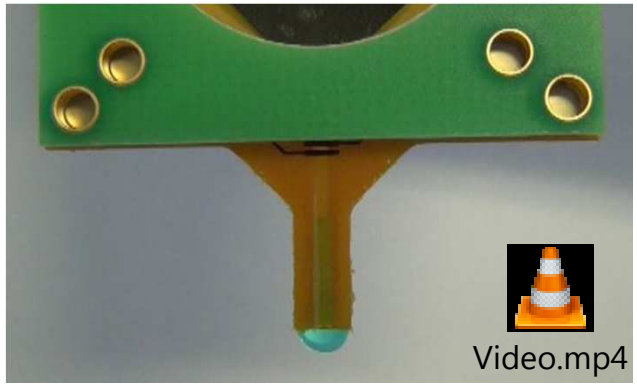
Nano carbon based ionic actuators – System integration, as example micro pipette



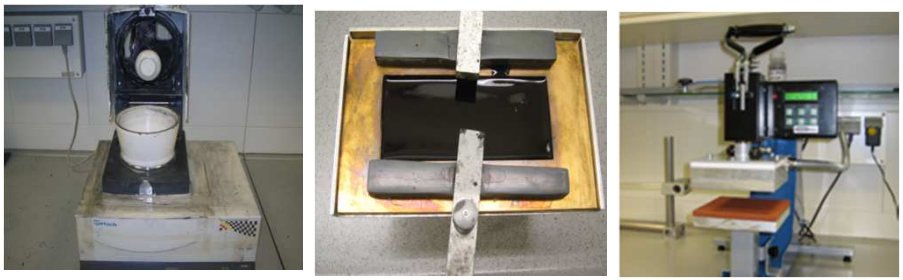
Fraunhofer IPA, Germany
AIST Kansai, Japan

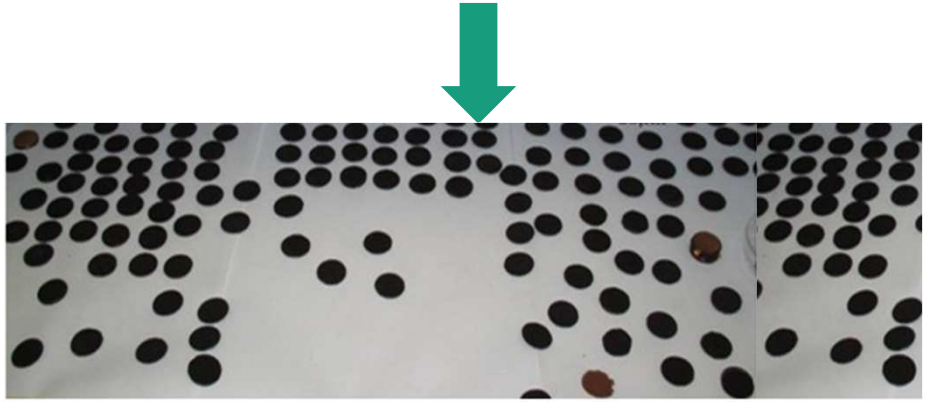
Pisa, 31.03.2014

Raphael Addinall

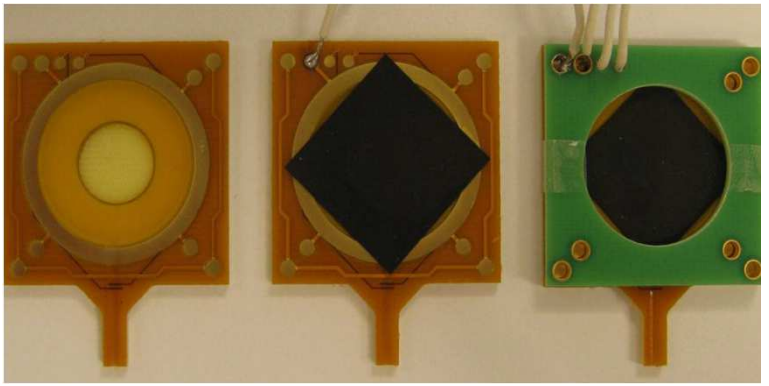
Fraunhofer IPA

Pipette – experimental development

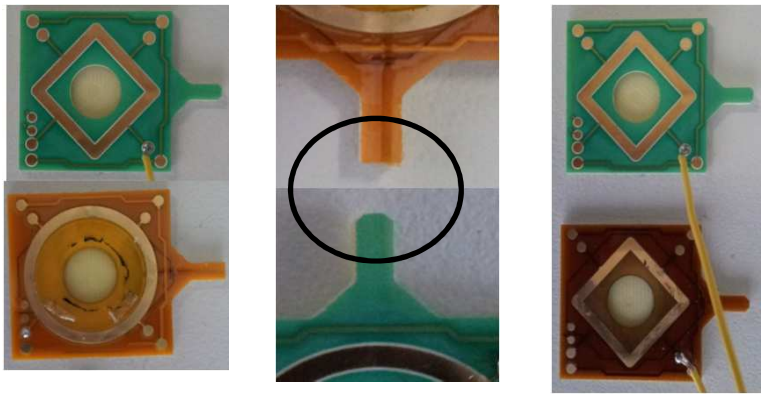




- Pipette able to suck and dispense liquid
- Electrode material: CNT/IL/PANI or PVDF & solvent
- Geometries: square/round, thickness >300<450µm



Contacts | Geometry | Material



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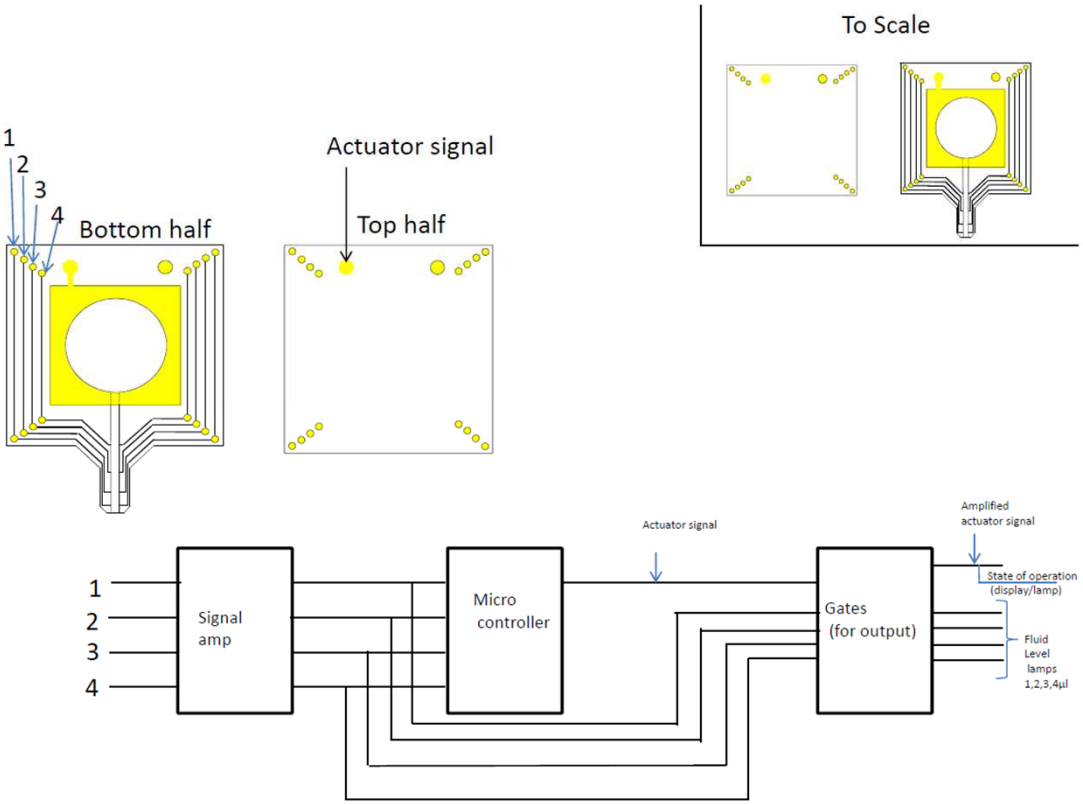
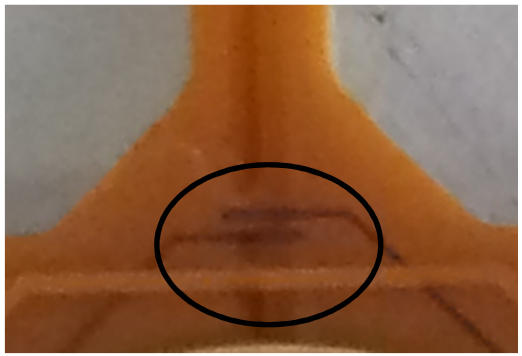
Sensors & intelligence





Sensors

- Dosing limits
- Biological species
- Radioactivity

Material as intelligent sensor

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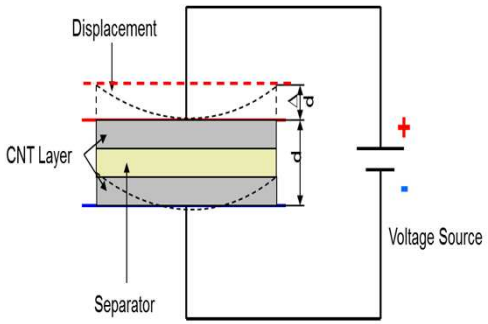
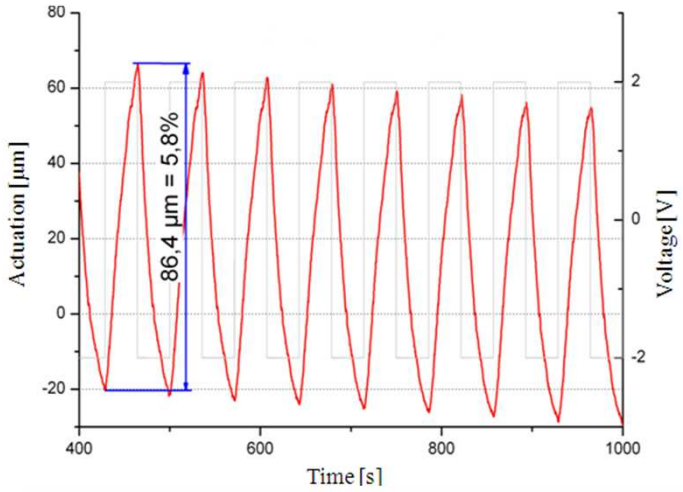
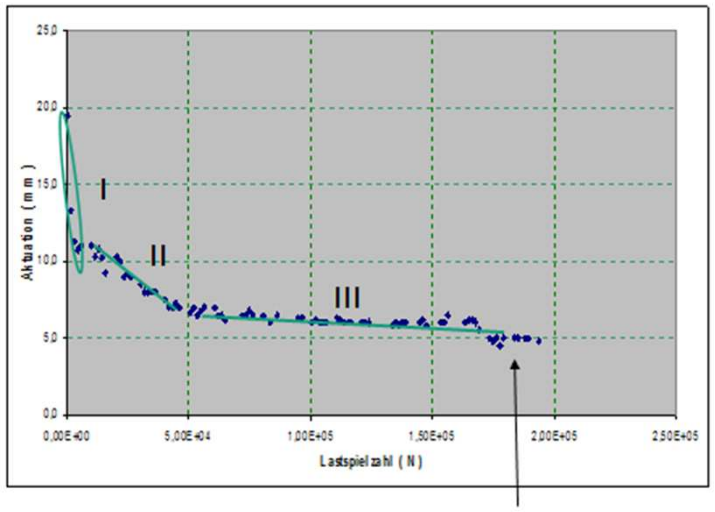
Characteristics of our CNT based *i*EAPs

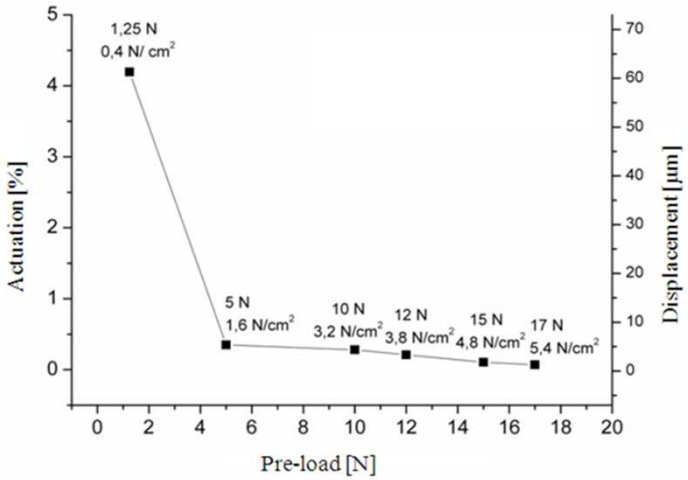
- Square wave voltage
- Potential of 4 Volt
- Frequency of ~ 0,02 Hz
- Room conditions







After 135 days the actuator is still working stable



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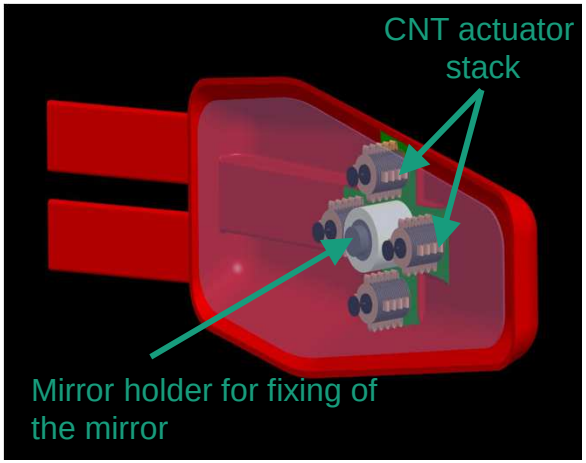
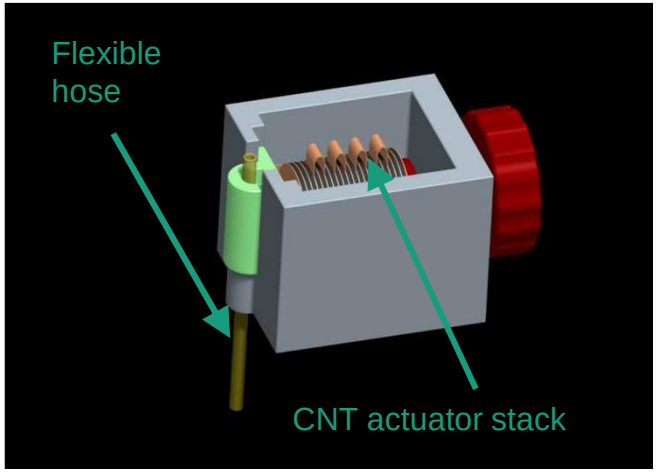
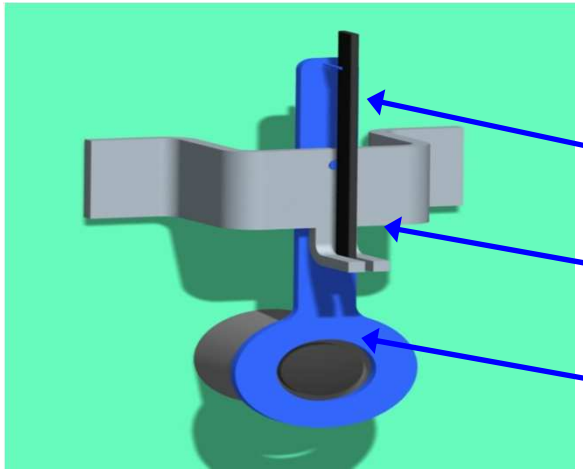
System integration







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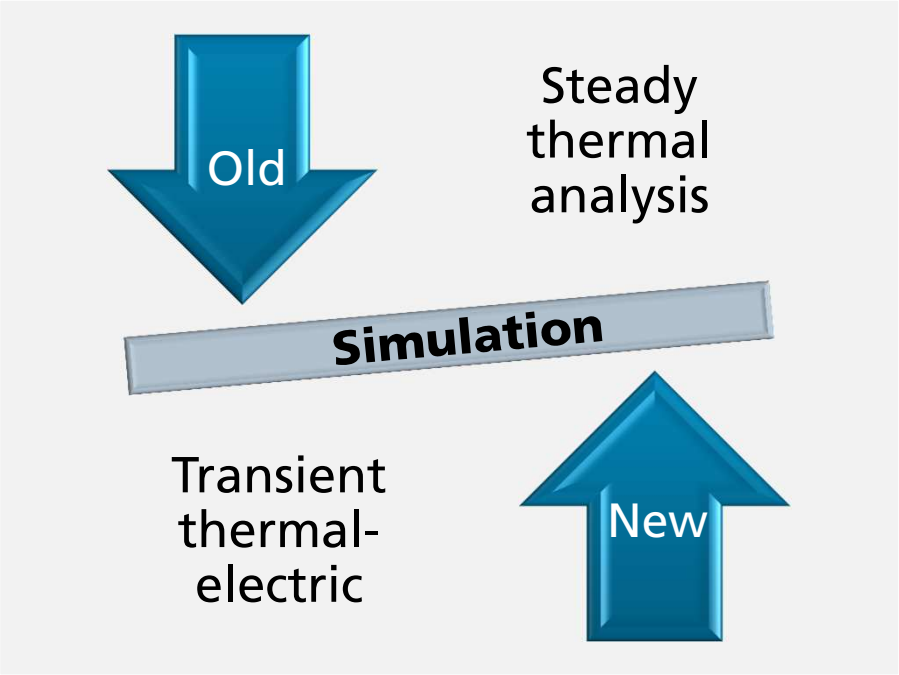
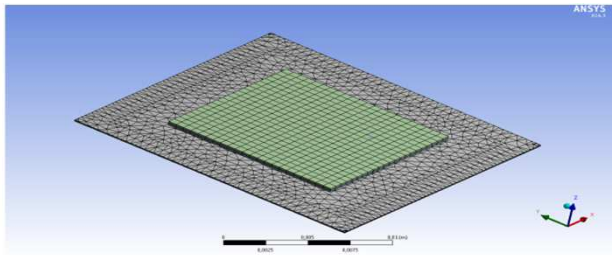
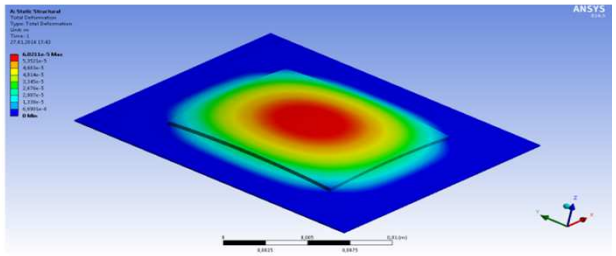
Pipette – simulation



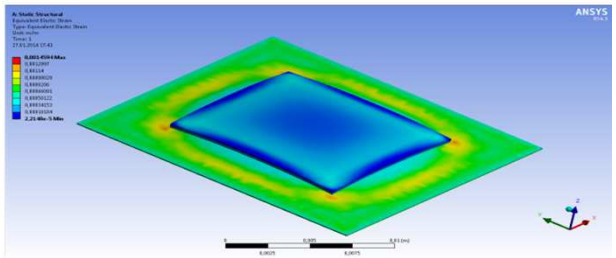
"From steady thermal analysis to transient thermal electric simulation - parameter analogy where the overall displacement of the geometry can be any function of electric charge applied to the geometry."



Meshed quadratic actuator



Simulated total deformation



Internal equivalent stress

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Thank you for your attention

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Process Engineering of Functional Materials

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