Simulation and Experimental Characterizations of a Thin Touch Mode Capacitive Pressure Sensor

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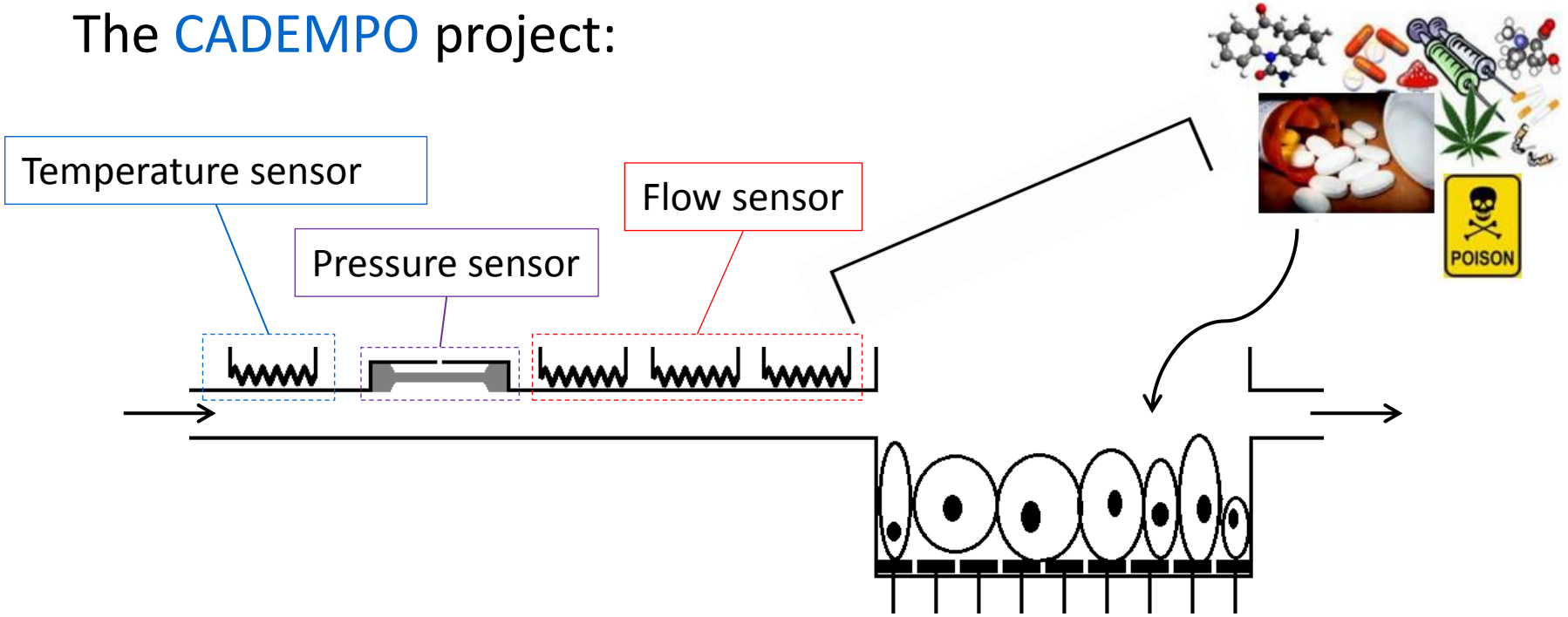
COMSOL CONFERENCE 2015 GRENOBLE

The CADEMPO project:



To provide low cost and disposable sensors to control in vitro cell cultures for therapeutic and toxicity tests.

Outline

- Introduction
- FEM model
- Modeling assumptions
- Simulation
- Validation process
- Conclusion

Introduction

- Capacitive-type pressure sensor
- Normal mode

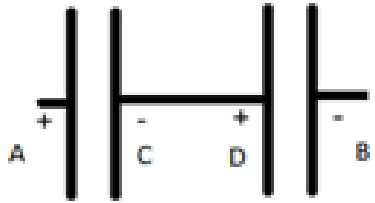
How to linearize the C-P characteristics?

- Touch mode

Touch mode enables linearization of the C-P charcteristics

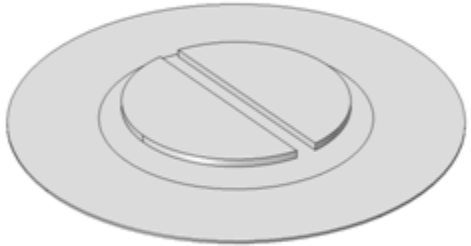
FEM model

Capacitor configuration



Equivalent model

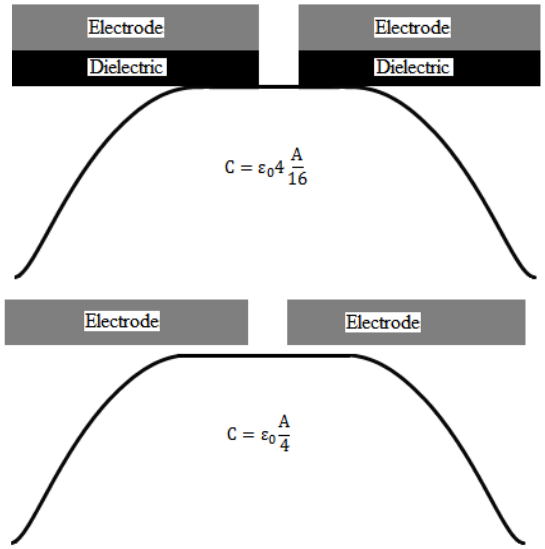
Sensor geometry



Diaphragm is axisymmetric
Electrodes are symmetric

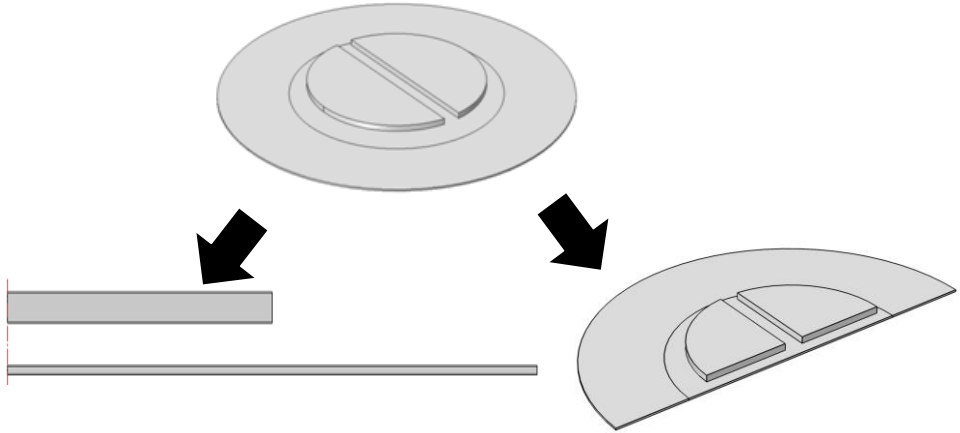
Modeling assumptions

Real system simplification



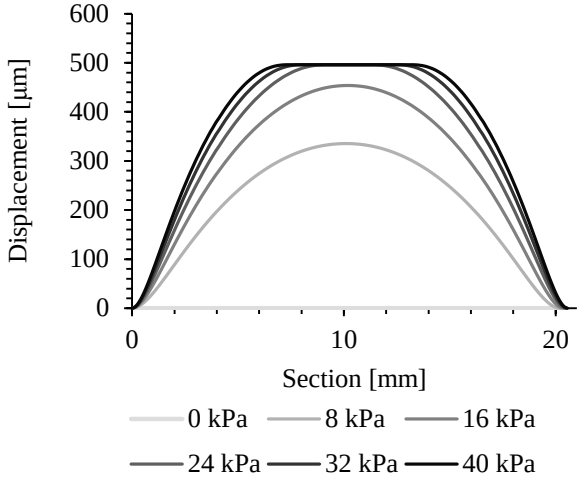
Equivalent model without dielectric

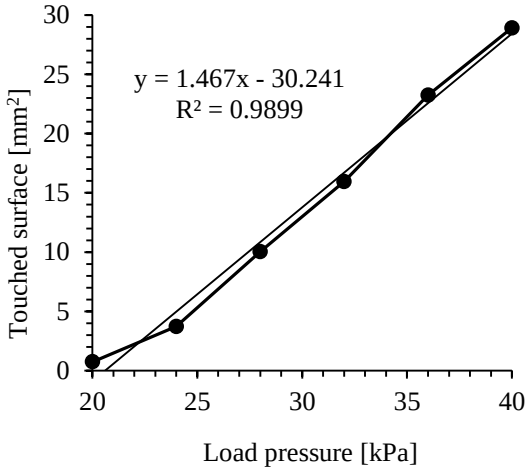
Modeling strategy

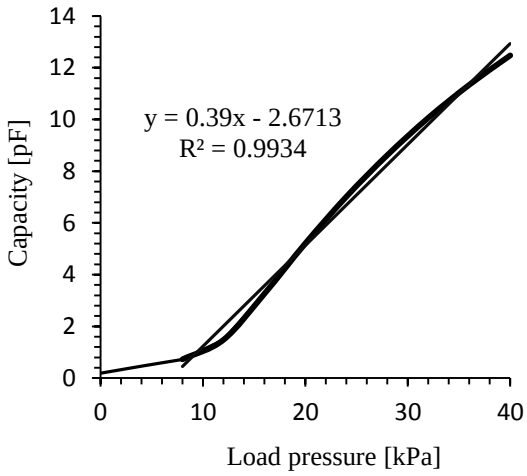


2D-axysymmetric model,
3D model coupled via the general extrusion operator

Simulation





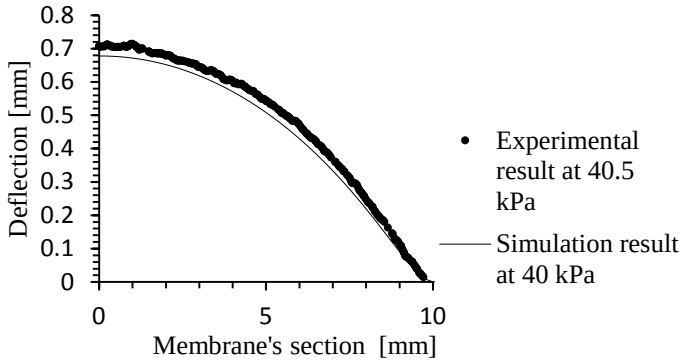


Small error of non-linearity

Linear range: 9-40kPa

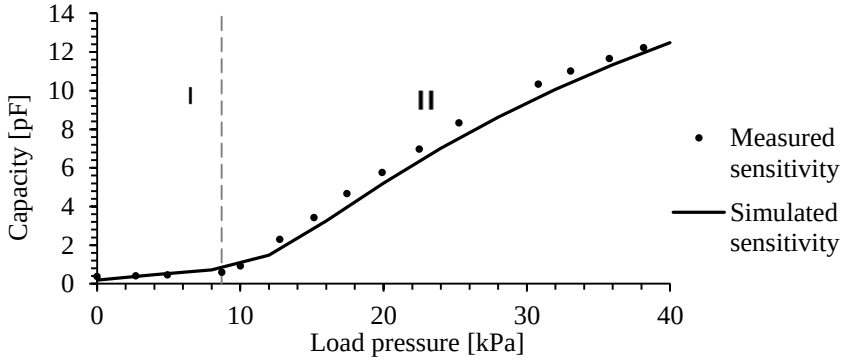
Validation process

Diaphragm deformation



Excellent matching with experimental data.

Sensor response



Excellent matching between physical system and simulation.

Conclusion

- A-3D multiphysics model has been developed for the pressure monitoring of a fluid in a channel.

- Geometry simplifications, symmetry and model coupling were successfully used to reduce the computational time.

- The model was validated through experimental data.

Thank you for your attention

Fabrication method