

Piezoelectric MEMS

WORKSHOP

Introduction

Piezoelectric microsystems (piezo-MEMS) technology is now available to industry for application in commercial devices. The new technology offers unparalleled actuation efficiency, sensing accuracy, miniaturisation and cost-effectiveness. It has evolved through fusion of two reputable technologies; silicon-based microsystems and piezoelectric materials. A decade of targeted research has made the development possible. Strong research groups in the Nordic countries have played critical roles for the development.

This workshop will summarize the state-of-the-art of piezo-MEMS using thin and thick film technology. The results from two recent Nordic projects will be presented:

- The NORD-pie project has tested the feasibility and availability of small scale and high quality industrial fabrication of piezo-MEMS devices in the Nordic countries. The production process is a silicon-on-oxide (SOI) wafer process combined with deposition of piezoelectric PZT (lead zirconate titanate, $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$).
- The Pi-MEMS project has dealt with the integration of piezoelectric thick films in MEMS aimed at two main applications: piezoelectric accelerometers and high-frequency ultrasonic transducers for medical imaging. The MEMS are processed by classical as well as innovative wafer processes and the PZT thick films are deposited by screen printing.

In addition to a presentation of results from the two projects, the workshop will introduce the services available for the realisation of new MEMS devices with integrated functional elements, both at SINTEF's cleanroom facility, MiNaLab in Oslo, and at DANCHIP in Copenhagen.

Scope

The workshop will present the new opportunities for piezo-MEMS development and production in Europe. It will describe the materials and technologies involved in the production of piezoelectric thin and thick film elements, and their integration with silicon technology. The capability to realise new products through prototype development and small-scale production will be presented and discussed.

Ample time will be allowed for informal discussions in order to create an efficient meeting place for industrial developers and researchers.

Who should attend?

The prime target group of the workshop is individuals that are engaged in industrial development of functional MEMS. In order to ensure the efficiency of the discussions the organisers reserve the right to limit the number of attendees.

Project web sites

NORD-pie project:
www.sintef.no/nord-pie

Pi-MEMS project:
www.nanotech.dtu.dk/Innovation/Research_Projects/PIMEMS.aspx

Organiser/contacts

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The workshop is sponsored by Nordic Innovation Centre and Danish National Advanced Technology Foundation through the NORD-pie and the Pi-MEMS projects, respectively.



DTU Nanotech
 Department of Micro- and Nanotechnology



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Program: Wednesday May 21st

10:00-10:30	Registration
10:30-10:35	Welcome (E. Ringgaard, Insensor A/S)
10:35-10:45	Presentation of DTU Nanotech (E.V. Thomsen, DTU Nanotech)
10:45-11:25	Review of piezoelectric MEMS with PZT thin films (F. Tyholdt, SINTEF)
11:25-12:00	Review of piezoelectric MEMS with PZT thick films (R. Lou-Møller, Insensor A/S)
12:00-13:00	Lunch
13:00-13:20	Applications of PZT thick films (T. Zawada, Insensor A/S)
13:20-13:40	MEMS technology at SINTEF (E. Poppe, SINTEF)
13:40-14:10	pMUT transducers for medical applications (T. Pedersen, DTU Nanotech)
14:10-14:40	Break
14:40-15:00	MEMS based gas sensor applications (P. Gløersen, Infineon Technologies Sensor AS)
15:00-15:20	Piezoelectric MEMS microphone arrays (H. Ræder, Sonitor Technologies AS)
15:20-15:40	Packaging of MEMS devices (P-E. Fägerman, Mandalon Technologies AB)
16:00-17:00	Visit to DANCHIP
19:00	Dinner

Program: Thursday May 22nd

09:00-09:30	Piezoelectric MEMS accelerometer with thick-film PZT (C.C. Hindrichsen, DTU Nanotech)
09:30-09:50	Packaged MEMS accelerometer (E. Ringgaard, Insensor A/S)
09:50-10:10	Data storage tags for fish (S. Gudbjörnsson, Star-Oddi Ltd)
10:10-10:30	Break
10:30-10:50	Modelling and characterisation of MEMS devices (J. Juuti, University of Oulu)
10:50-11:20	aixACCT Systems GmbH
11:30-12:00	Optional visit to the newly opened DTU CEN, Centre for Electron Nanoscopy, the most advanced electron microscopy centre in Europe.
12:00-13:00	Lunch

The organiser of the workshop reserves the right to make any alteration in the program without notice and to limit the number of participants.

Venue

The workshop will be held at DTU Nanotech, a department of the Technical University of Denmark, situated in Lyngby, 15 km from the centre of Copenhagen. DANCHIP, Denmark's most advanced clean-room facilities, is located in the neighbouring building.

Accommodation

The participants are kindly asked to organise accommodation themselves and inform the organisers immediately of any alterations in their plans.

The following hotels are recommended:
 Gentofte Hotel, Gentoftegade 29, 2820 Gentofte
<http://www.gentoftehotel.dk/>

Sinatur Hotel Frederiksdal, Frederiksdalsvej 360, 2800 Lyngby
<http://www.frederiksdal.dk/>

Registration

Please register by sending an e-mail message to Unni Henriksen, SINTEF at unni.henriksen@sintef.no (Registration deadline May 19th)

The following information should be included in the message:

- Full name
- Affiliation (company/institution and postal address)
- E-mail address
- Mobile and office telephone nos.

The workshop is free except for lunches and dinner. We will send information about how to find the conference centre to the participants in advance.

