Deliverable D7.4
Open workshop

PiezoMAT Deliverable D7.4 PiezoMAT – 2016-10-31 D7.4 PiezoMAT *Open workshop*	
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EXECUTIVE SUMMARY

Work package 7

Deliverable: *T7.4: Open Workshop*

Lead partner: *MTA EK MFA & Fraunhofer*

Estim. P×M: *2*

Delivery date: *M36*

The current D7.4 report describes the action carried out within the "Task 7.1: Dissemination and standardization" – "PiezoMAT Open workshop". As declared in *the PiezoMAT DOW*, an open workshop should cover the major topics of the development carried out within the project being organized at the end of the 2nd – beginning of the 3rd year of the project duration.

Content

1 Introduction

It was initially planned that many representatives from scientific community, end user companies and governmental organizations will be able to visit the workshop event in order to validate the assumptions under PiezoMAT technology, become aware of its potential, and be trained on how to access and use such technology. Therefore, this event has been co-located with one of the major international scientific conferences – the XXXth EUROSENSOR 2016 held in Budapest 4-7.10.2016 (www.eurosensors2016.eu/):

*"**EUROSENSORS2016 was attended by 550 participants**, 78% of them came from academia and 22% from industry. 656 submissions were received from 46 countries for peer review, all were assigned to 5 reviewers. From the accepted ones **140 lectures (including 4 plenary talks and 7 keynote lectures**) were selected and presented in 12 categories ranging from theory to special applications in the automotive and healthcare fields. **330 posters** were presented and displayed for the entire duration of the conference to enhance discussions and networking possibilities."*

The PiezoMat workshop was organized by MTA EK MFA (a co-organizer of the main conference) as a satellite event of the conference. The workshop was held on the last day of the conference (Sep. 7, 2016) just before the closing ceremony. The majority of PiezoMAT partners have participated with their presentations as in the scientific program of the conference, as well as in the Open Workshop event.

2 Program of the Open Workshop

The obtained results, future research potential and market analyses were summarized in seven lectures delivered by the project partners. The corresponding information along with electronic files containing the presentation slides can be found in the public section on the project web-site:

http://www.piezomat.eu/Home & http://www.piezomat.eu/workshop. Some additional materials can be found in Annual Report #3.

Here, a short summary of the presented materials is given:

- **The PiezoMAT project**, *Antoine Viana, CEA LETI, France*

  This is a general presentation of the project's aims and scope along with an brief introduction of the PiezoMAT consortium partners along with their specific roles in the sensor development.

- **Experience of LETI in microsystems technologies applied to PiezoMAT project - Heterogeneous integration of nano-objects**, *Marjolaine Allain and Elise Saoutieff, CEA LETI, France*

  The overview of micro-system (electronic) technologies at CEA Leti is provided with a particular accent on heterogeneous integration techniques – the main topic related to the PiezoMAT sensor development.

- **High resolution fingerprint sensing – next generation in biometric identification**, *Stéphane Revelin, Safran Identity & Security, France*

  The presentation of the end-user - Safran Identity & Security – is focused on the two major aspects, which reflect the specific role of Safran in the project development: state of the art for fingerprint biometrics and the fingerprint recognition market along with perspectives for the PIEZOMAT technology.

- **On chip integration of piezolectric nanowires,** *Chris Sturm, Alexander Shkurmanov, Marius Grundmann, Universität Leipzig, Germany, János Volk, István Lukács, Nguyen Quoc Khánh, MTA EK MFA, Hungary*

  This presentation is directly related to the material development and Zno NW growth techniques. This report covers i) NW growth and multi-layer coating by Pulsed Laser Deposition (ULEI); and ii) NW growth by wet chemical technique (MTA TK MFA).

- **Piezo-electro-mechanical characterization of NW sensor structures**, *V. Lebedev, Fraunhofer IAF, Germany*

  Development of analytical approaches and measurement hardware employed for piezo-electro-mechanical characterization of ZnO-based, single NWs and addressable NW matrices is a topic of presentation given by Fraunhofer IAF.

- **Nanowire devices for beyond CMOS technologies: lithography & contacting challenges**, *Nilkolay Petkov, Tyndall National Institute, Ireland*

  Fabricating and inter-connecting nanowire devices using alternative high-tech techniques such as EBL and EBID are the main topics of the Tyndall's presentation.

- **Research and development of funtional monomers, polymers and materials**, *Alain Graillot, Specific Polimers, France*

  Presentation of SP was devoted to the company profile introduction (e.g. in the field of opto-electronic devices) and progress in NWs encapsulation development with a particular focus on Silver/Polymer hybrid materials employed in the PiezoMAT sensor.

3 Presentations at the XXX. Eurosensors conference

During the main conference event, the most valuable for the **research** community PiezoMAT findings were also presented in 2 oral and 5 poster presentations (see www.eurosensors2016.eu/). These presentations have been mostly devoted to the scientific and technological aspects related to the PiezoMAT development. The corresponding proceeding (full-length) papers will be published by Elsevier in *Procedia Engineering*, and optionally, also be submitted to the journal *Sensors and Actuators* for publication, if they pass the standard reviewing process of the journals. The seven contributions of the PiezoMAT partners are listed below:

[1] E. Saoutieff, M. Allain, Y-R. Nowicki-Bringuier, A.Viana, E. Pauliac-Vaujour: Integration of piezoelectric nanowires matrix onto a microelectronics chip (oral, ML.EMB-5-8473);

[2] J. Volk, J. Radó, I. E. Lukács, N. Q. Khánh, R. Erdélyi, G. Battistig, C. Sturm, M. Grundmann, A. Graillot, C. Loubat: Integrated Piezoelectric Nanowire Arrays for High Resolution Tactile Mapping (oral, WL.PRO-4-8618);

[3] A.Bouvet-Marchand, M. Loubat, A.Graillot, J.Volk, R.Dauksevicius, E.Saoutief, A.Viana, B.Christian, V.Lebedev, C.Sturm, C.Loubat: UV-crosslinked polymeric materials for encapsulation of ZnO nanowires in piezoelectric fingerprint sensor (poster, MP.PRO-17-8371);

[4] B. Christian, J. Volk, I. E. Lukács, E. Saoutieff, C. Sturm, A. Graillot, R. Dauksevicius, M. Seifikar, O. Ambacher, V. Lebedev: Piezo-force and vibration analysis of ZnO nanowire arrays for sensor application (poster, MP.PRO-33-8596);

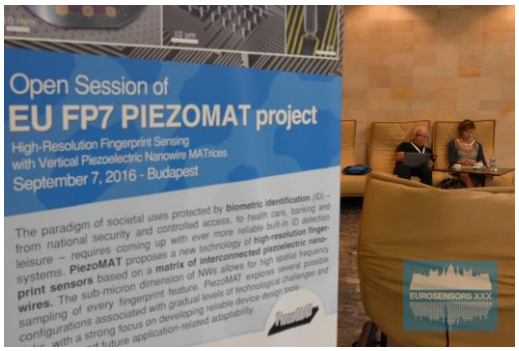
[5] A. Shkurmanov, C. Sturm, H.Hochmuth, M. Grundmann: Growth kinetics of ultrathin ZnO Nanowires grown by Pulsed Laser Deposition (poster, MP.PRO-22-8432);

[6] R. Dauksevicius, R. Gaidy, E. P. O'Reilly, M. Seifikar: Finite Element Analysis of Polymer-Encapsulated ZnO Nanowire-Based Sensor Array Intended for Pressure Sensing in Biometric Applications (poster, TP.THE-20-8354);

[7] A. Graillot, A. Bouvet-Marchand, C. Loubat: Specific Polymers - Functional Polymers and Materials for Optoelectronic Devices and Sensors (poster, TP.PCK-2-1018);

4 Summary of D7.4

The PiezoMAT workshop event, organized by MTA TK MFA with an extensive help of other PiezoMAT partners within the scope of the EOROSENSOR 2016 conference, has attracted much attention from the conference participants. In seven lectures from the project partners, obtained results, future research potential and market opportunities were considered and thoroughly analyzed.



As the workshop event was an official part of the general conference program, it was good advertised among the community, and, as a result, was quite well attended. It is important to note that besides the presentations of the actual technical and scientific achievements within the PiezoMAT project, the consortium members received an unprecedented opportunity to introduce their companies and institutions to the wide European sensor and micro-system community.