

Welcome

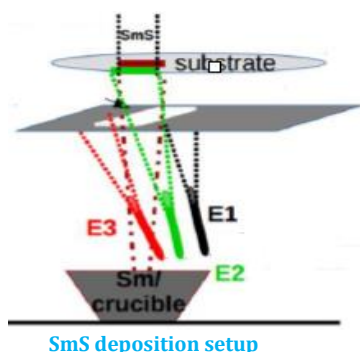
Welcome to the 2nd newsletter from the PETMEM Consortium – keeping you up to date with our activities and general topics of interest. We are on twitter, follow us @petmem2020 to receive all the latest updates.

The PETMEM Project

We are working to develop new materials and characterization tools to enable the fabrication of an entirely new low-voltage, memory element. Our workflows will tackle the most important barrier currently slowing down the expected evolution of CMOS; that is the fundamental limit on the further lowering of line voltage arising from Boltzmann's law. Power, proportional to voltage squared is not lowered and hence speeding up chip operation would exceed acceptable power consumption, leading to the stasis in speed. The PET technology transduces voltage to stress, activating a facile insulator–metal transition, thereby achieving multi-GHz switching speeds, as predicted by modelling, at lower power than the comparable generation field effect transistor (FET).

Highlights to date

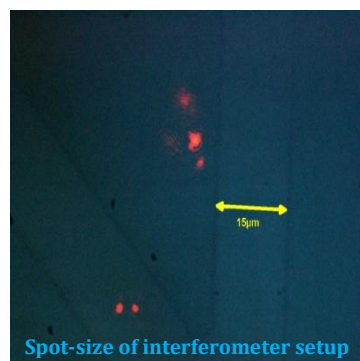
The PETMEM consortium was at the SINTEF MiNaLab in Oslo, Norway on the 1st and 2nd of June 2016 for our Month-6 project meeting. Since the Oslo meeting, IBM, SINTEF and aixACCT have designed a set of test



SmS deposition setup

structures to allow for the evaluations and testing of different material parameters. This mask set will be used to evaluate the behaviour of the different layers in combination with each other to check process compatibility. As of Month 12, significant progress has been made on the deposition of both Piezoelectric (PE) and Piezoresistive (PR) material on suitable substrates for generation-1 of

the PETMEM device. The University of Gent has performed more than 70 thin film deposition experiments in order to find the best parameters for SmS deposition via e-beam evaporation under H₂S atmosphere. They found that all films with the SmS phase present a switching behaviour between the semiconducting and the metallic state, with shifts to greater angles (metallic state) in XRD patterns and changes in optical spectra. aixACCT has installed their set-up for force measurements utilizing a macro-cantilever adapted by means of a differential amplifier to high resistance measurement. They have started to perform measurements on the SmS samples from UGent with some initial



Spot-size of interferometer setup

Meet the PETMEM Team

We will be attending the following events in the forthcoming months:

April 19-21, 2017: Dielectrics 2017 - Institute of Physics, NPL, Teddington, UK.

April 17-21, 2017: MRS Spring Meeting and Exhibition – Phoenix Convention Centre, Arizona, USA.

May 7-11, 2017: IEEE International Symposium on the Applications of Ferroelectrics (ISAF) - Atlanta, GA, USA.

May 19-22, 2017: Piezo2017 - Cercedilla (Madrid) SPAIN.

September 20-21, 2017: 20th anniversary of the opening of the XMaS beamline - Grenoble, France.

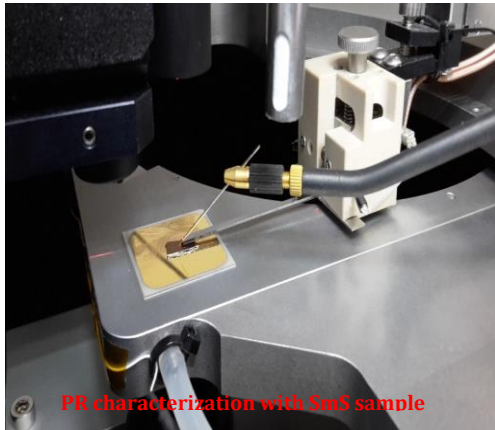
November 26 - December 1, 2017: Materials Research Society Fall Meeting & Exhibit, Boston, Massachusetts, USA.

PETMEM Month-12 Consortium meeting is scheduled to be held on the 8th and 9th December 2016 at IBM Zurich, Switzerland.

PETMEM Month-12 Project Review is scheduled to be held on the 15th December 2016 in Brussels, Belgium.

Ivan Rungger (NPL) gave a talk at the workshop titled New Horizons for Memory Storage: Advancing Non-volatile Memory with

results that are promising. aixACCT visited the group of Professor Susan Trolier-McKinstry of Pennsylvania State University in early March 2016 to learn about her activities in the field of interferometry and small spot size measurements. Taking the experience of Penn State into account aixACCT has realized their setup for small pad size characterization. It comprises an interferometer with additional optics, vibration damper and acoustic isolation chamber. This preliminary setup allows us to study different optical and mechanical setup variations and scanning mechanism for further development. Collaboration within the consortium to develop integrated in-situ metrology tools for reliability testing and cell testing using



PR characterization with SmS sample

analog signals is progressing well. aixACCT Systems has installed a setup for reliability testing that allows up to 64 samples to be tested in parallel. The system consists of a microcontroller, a switch-matrix and software for data acquisition. Reliability test on PE samples from SINTEF is planned for Q1 of 2017.

The University of Edinburgh has withdrawn from the PETMEM project due to the transfer of key personnel to another member of the consortium who will be implementing their tasks. SINTEF was at the 2016 MRS Fall Meeting & Exhibit in Boston, Massachusetts, USA where they presented key Piezoelectric film deposition tool development from PETMEM. Abiola Oladipo (BNC) attended the EU science communications event in Manchester UK, and came back with lots of good dissemination ideas including the use of augmented reality and interactive platforms for project outreach to the general public. PETMEM will adopt and implement this AR approach for public engagement in Q4 of 2017. Electrosiences is leading the commercial planning, even at this early stage, of the work so far (end Year 1). This has been of value to the partners and we have adopted the use of the Business Model Canvas to populate our ideas and options onto one piece of paper per opportunity. We will continue to work on these plans during the next stages of the research, and further deepen our public outreach programme.

Atomistic Simulations in Dublin, Ireland as well as Smart Actuation 2016 in Sheffield, UK.

Markys Cain (ELECTRO) was at IOM3's workshop on X-ray & Neutron Scattering in Multiferroic and Ferroelectric Materials Research held in London.

BNC and Electro has been engaging with groups outside the scientific community through the Knowledge Quarter in heart of London.

PETMEM Publications

From NPL:

X. Zhong, I. Rungger, P. Zapol, and O. Heinonen, X. Zhong, I. Rungger et al., Phys. Chem. Chem. Phys., 2016,18, 7502-7510.

X. Zhong, I. Rungger, P. Zapol, and O. Heinonen, Phys. Rev. B 94, 165160 – Published 24 October 2016.

Learn more:

Please visit our website (www.petmem.eu) for more information about the PETMEM project and the consortium members. Please follow us on twitter (@petmem2020)