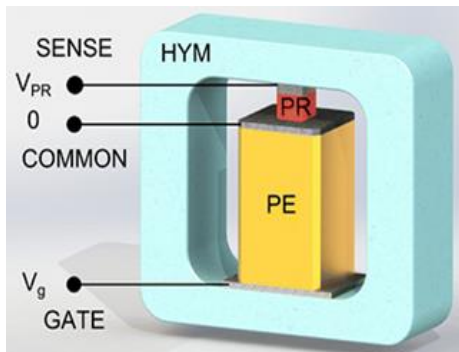


## Welcome

Welcome to the 1st newsletter from the PETMEM Consortium – keeping you up to date with our activities and general topics of interest.

## 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

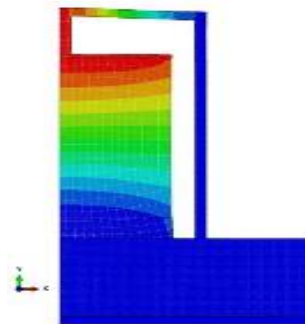


further lowering of line voltage arising from Boltzmann's law. Power, proportional to voltage squared is not lowered and hence speeding up chip operation would exceed acceptable power consumption, leading to the stasis in speed. The PET technology (on the left) transduces voltage to stress,

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

At the kick-off meeting hosted by BNC in London, UK (January, 2016), the consortium led by Prof Stuart Parkin of MPG agreed on the critical dimensions of the PETMEM device to be developed and materials to be used within the project. Since then, advance finite element (FE) models were developed by NPL to explore the sensitivity of the device to some of the key geometric parameters of the structure, with the aim of providing guidance on device design for experimental realization. The results (on the right) of these models are already enhancing design decisions made during fabrication. Also, SINTEF implemented the deposition of 20 wafers (shown below) with PZT on Pt electrodes for the



generation-1 pipe-cleaning demonstrator (the first of 3 generations of material sets for device fabrication). Furthermore, Prof. Markys Cain [Electrosiences Ltd, UK] attended the 2016 International Workshop on Acoustic Transducer Materials & Devices, 9-12 May 2016, held at Pennsylvania State University, PA, USA. The EU H2020 Project

'PETMEM' was provided with a 3 minute pitch and poster slot under the single crystals materials and devices session. Prof Cain outlined the

## Meet the PETMEM Team

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

**June 6, 2016: ETSF - Young Researchers' Meeting at King's College London, UK.**

**June 29 to July 1, 2016: New Horizons for Memory Storage: Advancing Non-Volatile Memory with Atomistic Simulations", Dublin, Ireland.**

**August 21-25, 2016: Joint IEEE International Symposium on the Applications of Ferroelectrics, European Conference on Applications of Polar Dielectrics & Workshop on Piezoresponse Force Microscopy, Darmstadt, Germany.**

**September 12 – 14, 2016: SPIE Photomask Technology, San Jose, CA, United States.**

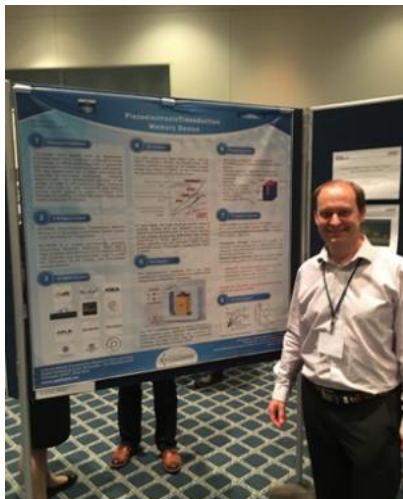
**September 19 to 22, 2016: European Materials Research Society Fall Meeting & Exhibit, Warsaw, Poland.**

**November 27 - December 2, 2016: Materials Research Society Fall Meeting & Exhibit, Boston, Massachusetts, USA.**

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

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

PETMEM project's key aims and objectives which culminated in a great deal of interest from the audience and subsequent poster session. The workshop provided a forum for reports on, and discussions of, the state-of-the-art in materials and devices to generate, detect, and suppress sound. Naturally, this then included the concepts behind the Piezoelectric transistor technology central to the PETMEM project. Prof Cain (picture below) also met and discussed the project with International steering committee member, Prof Susan Trolier-McKinstry of Penn State University, and later



contributed to the IEEE standardisation committee on single crystal materials. The drive towards higher quality piezoelectric thin films and further integration into MEMS/NEMS electronic devices was noted as well as the continuing route taken to develop higher temperature single crystal piezoelectric materials. Details can be found on the PETMEM website [[www.petmem.eu](http://www.petmem.eu)].

For aixACCT Systems Germany, the world-leading supplier of industrial piezoelectric test systems, it is an excellent opportunity within the PETMEM project to closely interact with the partners in characterization and developing new metrology for lateral resolution measurements below 2  $\mu\text{m}$  on piezoelectric thin films in their interferometer systems and furthermore extend testing capabilities into the field of piezoresistive materials. AixACCT will be exhibiting at ISAF conference in Darmstadt in August 2016 with a booth and presentation. 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. The extensive discussions that ensued about the completed and upcoming deliverables and milestones were very fruitful. This was followed by a tour of the SINTEF Minalab which allowed the consortium (picture below) to see the diverse technical capabilities available at this world-class facility. As we look forward to the next 6 months of the project, we are excited and filled with great expectations for progress towards demonstrating a new low-voltage memory element.



Jean Fompeyrine of IBM has been invited to give a talk at the MRS 2017 conference in Boston, Massachusetts, USA.

PETMEM partner BNC is a member of the Knowledge Quarter in heart of London, UK. BNC will be leveraging on connections and KQ dissemination events to reach out to potential end users and the general public.

## PETMEM Publications

From NPL:

X. Zhong, I. Rungger et al., Phys. Chem. Chem. Phys., 2016,18, 7502-7510.

Article on PETMEM has been requested for the IOP science special edition on Piezotronics, for Semiconductor Science and Technology.

## Learn more:

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

