

Piezoelectric & capacitive micro & nano systems for ultrasound transducers and energy conversion

Our research focuses on the **modeling, design** and **characterization** of micro and nano objects based on MEMS (Micro-Electro-Mechanical Systems) **capacitive** or **piezoelectric technologies**. Emergent technologies based on **piezoelectric thick films, ZnO nanowire** devices or **cMUTs** (Capacitive Micromachined Ultrasonic Transducers) are covered in our work, starting with the fabrication of basic components and up to their integration in a device.

The design of these devices is carried out with the objective to optimize the choice of deposited materials, to propose innovative choices in terms of materials and / or substrates, and to study their influence on the performance of the final device. Finally, the sizes of these devices, from few hundred nanometers to several tens of millimeters, are extremely rich in terms of involved acoustic phenomena.

Several members of this research group are invested in the **Piezo Institute**, a European research network gathering together several academic laboratories and companies, leaders in piezoelectricity.

Ongoing projects

MEPS : (Module a Energie Perpetuelle sur Substrat flexible) - Project of Region Centre-Val de Loire (2015 - 2018). Coordinator: GREMAN. Partners: GREMI UMR 7344 CNRS (Orleans), STMicroelectronics (Tours), GREMAN.

SIPeMUT : (Application du silicium poreux a la realisation de substrats pour les sondes cMUT) - Project of Reegion Centre-Val de Loire (2015-2017). Coordinator: GREMAN. Partners: INSERM U930 « Imagerie et Cerveau », VERMON (Tours), Silimixt (Tours), Echosens (Paris), GREMAN.

BrainMUT : (Technologie cMUTs pour l'imagerie du tissu cerebral) - Project of Region Centre-Val de Loire (2015-2017). Coordinator: INSERM U930 (Tours). Partners: VERMON, GREMAN.

HEcATE : (High Efficiency piezoelectric Alternative materials: Towards Environmental-friendly solutions) - ANR project (2015-2017). Coordinator: GREMAN. Partners: Thales R&T (Palaiseau), IEMN UMR 8520 CNRS (Lille), ICMCB UPR 9048 CNRS (Bordeaux), SPTCS UMR 7315 CNRS (Limoges), CristallInnov (Chambéry), VERMON (Tours).

FLexIBLE : (Thin Film of Lithium and ZnO nanogenerator: all Integrated for « perpetual Battery » on fLExible substrates) -ANR project (2014-2018). Coordinator: GREMAN. Partners: GREMAN, STMicroelectronics Tours.

Lab-TMEMS : (Laboratoire commun sur les transducteurs et microconvertisseurs électromécanique pour applications Medicales) - ANR project (LabCom funding 2014-2017). Partners: Vermon SA (Tours) - GREMAN.

TUMAHl : (Plateforme ultrasonore de diagnostic et therapie ciblee) - Project of DGA 2014 (2015-2017). Coordinator: VERMON.

EnSO : (Energy for Smart Objects) <http://www.enso-ecsel.eu/> -H2020 ECSEL project 2016-2020). Coordinator: STMicroelectronics Tours. Partners: 34 participants in 8 European countries. GREMAN main partners: Fraunhofer IIS (Nurnberg), University of Liege and Prayon company (Liège).

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