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PRESS RELEASE

Successful industrialization of high-density 3D integrated silicon capacitors for ultra-miniaturized electronic components

Three high-tech SMEs finalize the joint EU-funded PICS project on innovative ALD materials and manufacturing equipment

Caen, Oct. 22, 2015 – Two years after the launch of the PICS project (funded by the FP7 funding instrument dedicated to research for the benefit of SMEs), three European SMEs, IPDiA, Picosun and SENTECH Instruments along with CEA-Leti and Fraunhofer IPMS-CNT announce the major technological results achieved during this program.

Started in September 2013, the PICS project was focused on developing innovative dielectric materials deposited by atomic layer deposition (ALD) and related tools (ALD batch tool and etching tool) to bring to mass production a new technology of high-density and high-voltage 3D trench capacitors targeting high-end markets like medical or aeronautics. Capacitors are key components presented in every electronic module. The integrated silicon capacitors technology offered by the SME IPDiA outperforms current technologies (using ceramic or tantalum substrates) in stability in temperature, voltage, aging and reliability and enables to build highly integrated and high-performance electronic modules.

The consortium's three major technological results are:

- A novel ALD batch tool was developed by Picosun and Fraunhofer IPMS-CNT. It enables to reduce cost-of-ownership and deliver better uniformity and step coverage for high-K dielectrics into 3D structures. With its demonstrated, optimized and production-proven ALD processes, Picosun is solidifying its position as a technological leader in the IC, Semiconductor, MEMS markets, from R&D to production systems.
- A new process for accurately etching high-K dielectrics, which are very specific materials, was demonstrated by SENTECH with the help of Fraunhofer IPMS-CNT. As a result, SENTECH has the potential to gain market share in the field of high-k materials, which have high interest for different applications, e.g. LED, MEMS, magnetic data storage.
- Two new dielectric stacks were developed and integrated into the IPDiA 3D trench capacitors by IPDiA, CEA-Leti and Fraunhofer IPMS-CNT. The initial specifications were fulfilled and proven by electrical measurements. A new record on capacitance density ($>500\text{nF/mm}^2$ at 3.3V) and an extended operation voltage (10V with 150nF/mm^2) were obtained, which expands IPDiA's ability to meet current market requirements particularly in the field of medical or aeronautics. Qualification procedure was initiated during the project by launching preliminary reliability studies and it will continue in the coming months.

On top of these R&D results, the other main objective of PICS was the industrialization of this new integrated capacitors technology. Thanks to the partnerships set up, the manufacturability and financial viabilities were ensured by developing adequate industrial tools targeting mass production.

The PICS project is a success for all three SMEs and a good example of the benefits brought by the EU funding instrument "Research for the benefit of SMEs". The SMEs were able to outsource a part of their research to get from RTD performers innovative know-how and cutting-edge technological processes. The project was built to answer the SMEs' specific needs and a common goal was set up around the new IPDiA capacitors technology and the specific tools (ALD batch tool and etching) required for its commercial exploitation.

About PICS

The PICS project has received funding from the European Union's Seventh Framework Program managed by REA-Research Executive Agency <http://ec.europa.eu/rea> (FP7/2007-2013) under grant agreement n° FP7-SME-2013-2-606149.

The PICS Project will last for two years and the consortium consists of three SMEs: IPDiA (France, coordinator), Picosun (Finland) and Sentech Instruments (Germany), and two leading research organizations: Fraunhofer CNT (Germany) and CEA-Leti (France). Project objectives are to develop innovative atomic layer deposition materials and tools and to bring to mass production a new technology of high density and high voltage capacitors.

Further information is available at www.fp7-pics.eu

About IPDiA

IPDiA is a preferred supplier of high performance, high stability and high reliability silicon passive components to customers in the medical, automotive, communication, computer, industrial, and defense/aerospace markets. The company portfolio includes standard component devices such as silicon capacitors, RF filters, RF baluns, ESD protection devices as well as customized devices. IPDiA headquarters are located in Caen, France. The company operates design centers, sales and marketing offices and a manufacturing facility certified ISO 9001 / 14001 / 18001 / 13485 as well as ISO TS 16949 for the Automotive market.

For further information, please visit www.ipdia.com

About Picosun

Picosun is the world leading provider of ALD solutions for global industries. Picosun's pioneering, unmatched expertise in ALD equipment design and manufacturing reaches back to the invention of the technology itself. Today, PICOSUN™ ALD systems are in daily production use in numerous prominent industries around the globe. Picosun is based in Finland, it has its subsidiaries in USA and Singapore, and world-wide sales and support network. For more information, visit www.picosun.com.

About SENTECH Instruments

SENTECH Instruments GmbH develops, manufactures, and sells worldwide advanced quality instrumentation for Plasma Process Technology, Thin Film Measurement, and Photovoltaics. The medium-sized company founded in 1990 has grown fast over the last decades and has today 60 employees. SENTECH is located in Berlin, capital of Germany, and has moved to its own company building in 2010 in order to expand its production facilities.

SENTECH plasma etchers and deposition systems including ALD support leading-edge applications. They feature high flexibility, reliability, and low cost of ownership. SENTECH's plasma products are developed and manufactured in-house and thus allow for customer-specific adaptations. More than 300 units have been sold to research facilities and industry for applications in nanotechnology, micro-optics, and optoelectronics.

More information: www.sentech.de

About Fraunhofer IPMS-CNT

Fraunhofer IPMS-CNT is a German research lab that develops advanced 300 mm semiconductor process solutions for Front-End and Back-End-of-Line applications on state-of-the-art process- and analytical equipment. Research is focused on process development enabling 300 mm production, innovative materials and its integration into Systems (SoC/SiP) as well as nanopatterning through electron beam lithography.

Fraunhofer is the largest application-oriented research organization in Europe with 66 institutes and 22,000 employees.

More information: www.ipms.fraunhofer.de

About CEA-Leti

As one of three advanced-research institutes within the CEA Technological Research Division, CEA Tech-Leti serves as a bridge between basic research and production of micro- and nanotechnologies that improve the lives of people around the world. It is committed to creating innovation and transferring it to industry. Backed by its portfolio of 2,800 patents, Leti partners with large industrials, SMEs and startups to tailor advanced solutions that strengthen their competitive positions. It has launched 54 startups. Its 8,500m² of new-generation cleanroom space feature 200mm and 300mm wafer processing of micro and nano solutions for applications ranging from

space to smart devices. With a staff of more than 1,800, Leti is based in Grenoble, France, and has offices in Silicon Valley, Calif., and Tokyo. Follow us at www.leti.fr and @CEA_Leti.

Visit www.leti.fr for more information



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