STMicroelectronics
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STMicroelectronics, CEA-Leti and AIXTRON Develop Ultra-Thin Gate-Insulation Process for Advanced CMOS Transistors

Industry first as ST and CEA-Leti joint development research program demonstrates excellent results for new advanced process technology

Geneva, May 26, 2004 - STMicroelectronics (NYSE: STM) today announced that ST, CEA-Leti and AIXTRON have developed an advanced process technology for the creation of ultra-thin transistor-gate-insulation layers for low-power applications at the 65nm and 45nm CMOS transistor technology nodes. The new process significantly reduces transistor leakage current by the deposition of 'high-k' gate-insulation material.

To meet the future requirements of highly integrated devices postulated by Moore's law and described via the International Technology Roadmap for Semiconductors (ITRS), it will eventually be necessary to introduce new materials into the manufacture of advanced silicon devices. The three companies are developing new process technology aimed at the 45nm or 65nm technology nodes for low-power CMOS platforms optimized for portable applications.

Based on AIXTRON's Tricent® reactor technology, CEA-Leti and ST have created a joint development program for 'high-k' materials, fulfilling the specifications of advanced nano-metric CMOS gate-stacks that require a thick physical layer with a low leakage current equivalent to ultra-thin oxide.

The process, called AVD® (Atomic Vapor Deposition), has demonstrated excellent Equivalent Oxide Thickness (EOT) values of 1.15nm or 11.5Å (Angstroms) based on hafnium dioxide / silicon dioxide / silicon ($HfO_2/SiO_2/Si$) stacks offering leakage current densities as low as $J_L=6.8\cdot10\text{-}2A/cm^2$ at 1.5V.

The results were obtained by the Advanced Modules team of researchers from ST and CEA-Leti at ST's Crolles facility using a Tricent AIXTRON 200/300 mm bridge cluster tool. The HfO_2 deposited layer process was developed in conjunction with AIXTRON, and the wafer processing and the characterization were performed at CEA-LETI facilities in Grenoble.

Metallic oxides of the hafnium family are believed to be excellent candidates for the 'high-k' dielectric material that will eventually replace silicon dioxide in the basic CMOS transistor structure.

In addition to the ability to precisely deposit thin dielectric 'high-k' layers, the AVD technique also allows the deposition of metal gates necessary for the 45nm-and-below CMOS technology nodes.

"These proof-of-concept results are a first for this process technology," said Daniel Bensahel, Project Leader and Front-End Program Director at STMicroelectronics. "This joint development program between ST and CEA-Leti, in conjunction with AIXTRON, is

not only the first in the industry to implement this advanced process in an industrial environment; but more importantly, it is also achieving excellent results."

"The co-operation with STMicroelectronics and CEA-Leti is an integral part of our strategic CMOS development effort strengthening AIXTRON's position in emerging semiconductor applications. By working with one of the leading semiconductor device manufacturers and one of the top research organizations in the industry, AIXTRON will remain at the forefront of cutting edge enabling MOCVD process technology development. We have been highly impressed by the professionalism and the technical competencies of the STMicroelectronics and CEA-Leti team, and look forward to combining our expertise to develop solutions for advanced CMOS devices," said Tim McEntee, Executive Vice President and COO Semiconductor Equipment/ AIXTRON AG.

About AIXTRON
AIXTRON (Aachen, Germany) is, as verified by an independent market research institute, the world leading supplier of equipment for III-V semiconductor epitaxy. Its equipment is used by a diverse range of customers worldwide to manufacture critical, advanced components such as HBTs, PHEMTs, MESFETs, Lasers, LEDs, Detectors and VCSELs used in fiber optic communications systems, wireless and mobile telephony applications, optical storage devices, illumination, signaling and lighting, as well as a range of other leading edge technologies. Originally focusing on compound semiconductor applications over the last years AIXTRON has broadened its product portfolio to enabling MOCVD Technologies for advanced materials for next generations of mainstream semiconductor devices and Organic LED applications. To date, AIXTRON's total installed base of systems exceeds 800 tools worldwide. AIXTRON AG (FSE: AIX ISIN DE0005066203) is listed in the Prime Standard and Tec DAX of the German Stock Exchange (Deutsche Börse) and is included in the MSCI World Index.

About CEA-Leti
CEA-Leti (Grenoble, France) is a CEA Grenoble laboratory at the leading edge of European microelectronics and microtechnologies research. It employs about 800 people and with its more than 120 patents filed per year and its 30 start-ups created or being created, it ranks among the major partners of the industrial world. CEA is a polyvalent scientific and technological research organization, specialized in the fields of nuclear power, both civil and military, new energy technologies, information and communication systems and biotechnologies. Its ability to combine fundamental research and valorization in an industrial framework enables it to play a leading role in innovation. Some 16,000 people are employed at CEA in 10 sites in France.

About STMicroelectronics
STMicroelectronics is a global leader in developing and delivering semiconductor solutions across the spectrum of microelectronics applications. An unrivalled combination of silicon and system expertise, manufacturing strength, Intellectual Property (IP) portfolio and strategic partners positions the Company at the forefront of System-on-Chip (SoC) technology and its products play a key role in enabling today's convergence markets. The Company shares are traded on the New York Stock Exchange, on Euronext Paris and on the Milan Stock Exchange. In 2003, the Company net revenues were $7.24 billion and net earnings were $253 million. Further information on ST can be found at www.st.com

Editors' Note Part of the results of the development was obtained within the framework of the MEDEA+ T207 project.