SESSION 20 – TAPA III
GeMOSFETs

Thursday, June 17, 1:30 p.m.
Chairpersons: R. Jammy, SEMATECH
K. Shibahara, Hiroshima University

20.1 - 1:30 p.m.
Electron Mobility in High-k Ge-MISFET Goes to Higher, T. Nishimura, C.H. Lee, S. Wang, T. Tabata, K. Kita, K. Nagashio, A. Toriumi, The University of Tokyo, Japan

This paper will first discuss intrinsic advantages of high-pressure oxidation of Ge and then present further improvement of electron mobility in Ge n-MISFET using high-k gate stacks combined with high-pressure oxidation. The peak mobility is about 1500 cm2/Vsec, which is the highest one to date among unstrained Si and Ge MISFETs. Ge-CMOS is a strong candidate for beyond Si-CMOS.

20.2 - 1:55 p.m.
High-k/Ge *p*- & *n*-MISFETs with Strontium Germanide Interlayer for EOT Scalable CMIS Application, Y. Kamata, K. Ikeda, Y. Kamimuta, T. Tezuka, Toshiba, Japan

High-k/Ge with strontium germanide interlayer has been applied for both p- and n-MISFETs. The observed Jg-EOT trend in the Ge-MISCAPs exhibits comparable or superior leakage characteristics to that of state-of-the-art HfSiON gate dielectrics on Si, allowing EOT scaling down to 0.96nm. The drive current of the p-MISFETs increases with the EOT scaling around 1nm without meff degradation. Furthermore, reasonable Vth values are observed in both p- and n-MISFETs. These results suggest applicability of the SrGex interlayer to high-k/Ge CMISFETs.

20.3 - 2:20 p.m.
Impact of Ge Nitride Interfacial Layers on Performance of Metal Gate/High-k Ge-nMISFETs, T. Maeda, Y. Morita, Shinichi Takagi, NIRC-AIST, Japan

We propose a novel formation process of a Ge nitride interfacial layer (NIL) and demonstrate successful Ge-nMISFETs operation with NIL, for the first time.It is found that, compared to an oxide interfacial layer (OIL), NIL is quite effective in suppressing the generation of positive fixed charges and electron trapping centers in high-k/Ge gate stacks which degrade the FET performance. By combining NIL with HfO2 deposition, we successfully achieve excellent Ge-nMISFET operations, such as the SS of 74mV/dec and high electron mobility of 870cm2/Vs, compellable to that of Si.

20.4 - 2:45 p.m.
Experimental Demonstration of High Source Velocity and its Enhancement by Uniaxial Stress in Ge PFETs, M. Kobayashi*, J. Mitard*, T. Irisawa, T. Hoffmann*, M. Meuris*, K. Saraswat, Y. Nishi, M. Heyns*, Stanford University, USA, *IMEC, Belgium

High-field transport in short channel (70nm) Ge PFETs was, for the first time, thoroughly investigated, in terms of ballisticity and the relationship between carrier velocity and mobility, where 1.6x-2x higher velocity than that in Si PFETs was confirmed. The effectiveness of the uniaxial stress to velocity enhancement as a performance booster was experimentally demonstrated in short channel regime. 1.4x higher drive current can be achieved by strained Ge PFET in ballistic regime.