Gallium Oxide Electronics: Challenges and Opportunities

Gallium oxide (Ga$_2$O$_3$) has excellent material properties especially for power device applications that are represented by the extremely large breakdown field more than 5 MV/cm due to its large band gap of 4.5 eV. It is also attractive from an industrial viewpoint since large-size, high-quality wafers can be manufactured from a single-crystal bulk synthesized by melt-growth methods. These two features have drawn much attention to Ga$_2$O$_3$ as a new ultrawide bandgap semiconductor following SiC and GaN.

In this lecture, after a short introduction of material properties and features of Ga$_2$O$_3$, I will talk about our state-of-the-art Ga$_2$O$_3$ device technologies of metal-oxide-semiconductor field-effect transistors and Schottky barrier diodes.

Bio

Masataka Higashiwaki received the B.S., M.S., and Ph.D. degrees all in solid-state physics from Osaka University, Japan, in 1994, 1996, and 1998, respectively. After a two-year postdoctoral fellow, in 2000, he joined the Communications Research Laboratory (CRL), Japan, as a Researcher, where he was engaged in research and development on MBE growth and device processing of group-III nitride-based transistors. From 2007 to 2010, he took a temporary leave from the National Institute of Information and Communications Technology (NICT), which was renamed from CRL in 2004, and joined the Department of Electrical and Computer Engineering, University of California, Santa Barbara as a Project Scientist. He returned to NICT in 2010 and started a pioneering work on Ga$_2$O$_3$-based electronics. He is now a Director at Green ICT Device Advanced Development Center.

Dr. Higashiwaki was a recipient of several awards for his work on GaN and Ga$_2$O$_3$-based electronic devices, including the 2014 Japan Society for the Promotion of Science (JSPS) Prize, the 2007 International Symposium on CompoundSemiconductors (ISCS) Young Scientist Award, and the 2006 Japan Society of Applied Physics (JSAP) Outstanding Achievement Award for the Best Original Paper. He has authored and co-authored over 200 papers in technical journals and international conferences.

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