Heterogeneous Integration of Transparent Conductive Oxides with Silicon Photonics

ABSTRACT
Transparent conductive oxide (TCO) materials have attracted tremendous research interests for integrated photonic devices in recent years due to the extraordinary perturbation to the refractive indices achieved either through oxygen vacancy doping or electrical gating. In addition, high quality TCO materials can be deposited using DC- or RF-sputtering on various platforms including silicon platforms. Therefore, TCO materials are fully compatible with silicon photonics and promise unprecedented potentials for heterogeneous integration with silicon photonic integrated circuits. In this talk, I will review recent research progress in my group for the development of TCO-gated silicon photonic devices to achieve ultra-high energy efficiency, high speed photonic devices, including photonic crystal nanocavity modulators and microring resonators with ultra-large E-O tuning efficiency. We also achieved 5Gbit/s E-O modulation speed and will also discuss the strategy to further improve the energy efficiency to atto-joule/bit and implement large-scale integration for data centers.

SPEAKER BIO
Alan Wang received his B.S. degree from Tsinghua University, and an M.S. degree from the Institute of Semiconductors, Chinese Academy of Sciences, Beijing, P.R. China, in 2000 and 2003, respectively, and his Ph.D. degree in electrical and computer engineering from the University of Texas at Austin in 2006. From 2007 to 2011, he was with Omega Optics, Inc., Austin, Texas, where he served as the chief research scientist with more than $4 million of research grants. Since September 2011, he has been an assistant professor at Oregon State University in the School of Electrical Engineering and Computer Science. He was promoted to associate professor in 2017. He has more than 80 journal and conference publications, including 12 invited and plenary presentations. He holds three U.S. patents. He is a senior member of IEEE, SPIE and OSA.

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