

## Silicon Photonics: Recent Advances and Future Prospects



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### Abstract

Silicon photonics is attracting increasing attention around the world because of its important potential applications. Apart from having established applications in optical telecommunications, silicon photonics offers the possibility of solving the heat and high power dissipation problems of electrical interconnects that limit the performance of high speed computers. The development of silicon based optical modulators, photodetectors and other waveguide functional elements may eventually lead to the development of low-power dissipation, high-speed optical interconnects needed in future computers, as well as to the development of low cost optical chips for next-generation fiber-to-the-home networks. Another emerging area for silicon photonics is in optical sensing. Unlike silica glass, silicon has low optical loss at mid-wave infrared wavelengths, thus opening the possibility for spectroscopic applications of silicon chips at the mid-wave infrared wavelengths (3-5 microns) which correspond to the fundamental rotational and vibrational resonances of many different species of gases. This talk will review recent advances in silicon photonics at CUHK including work on nonlinear silicon photonics, the silicon Raman amplifier and laser, the use of ion implantation to enhance the performance on nonlinear devices, and ion implanted waveguides for silicon based photodetectors at the wavelengths used in optical communications. The narrow linewidths of the silicon Raman laser will be discussed in the context of possible applications in wavelength modulation spectroscopy applications. The prospects for integrated silicon chips for gas sensing applications at mid-wave infrared wavelengths will be discussed.

### Biography of Speaker

Professor Tsang Hon Ki received the B.A. (Hons) degree in 1987 in Engineering (Electrical and Information Sciences), and the Ph.D. and M.A. degrees in 1991, all from the University of Cambridge. He was a research visitor Bell Communications Research Inc. (Bellcore, USA) in 1990 (and again in 1993) and a postdoctoral fellow at the University of Bath (UK) between 1991-93. He joined the Department of Electronic Engineering at The Chinese University of Hong Kong in 1993. In 2001-03 he took no-pay leave from CUHK to manage R&D on silicon photonics at Bookham Technology plc. He has published over 200 papers in journals or conference proceedings and was a former chair of the IEEE LEOS Hong Kong Chapter. He currently serves as an associate editor of the IEEE LEOS Newsletter, and on the technical program committees of various IEEE and OSA conferences.