The Australian Synchrotron

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ABSTRACT

The theme of this presentation is the description of the application of synchrotron radiation to the fabrication of photonic and electronic devices. Synchrotron radiation, produced when high energy (GeV) electrons are deflected by a strong magnetic field, has a number of remarkable properties compared to other common photon sources. These include the very wide, continuously tuneable, spectral range, spanning the electromagnetic spectrum from the infrared to hard x-rays, the very high intensities that are achievable, the high degree of collimation, the well-defined polarisation, and the extremely small beam cross-section (1 μm).

For photonic devices in particular, these characteristics enable the fabrication of very high aspect ratio, small feature size structures (width : height ratio of 1:100) with vertical or controlled sidewalls that are smooth on the nanometre scale, leading to the possibility of fabricating a new generation of devices such as photonic bandgap structures with low excess loss.

In the first part of this paper the Australian Synchrotron, presently under construction in Victoria, will be described, along with some of its relevant optical characteristics. The second part will focus on the devices that may be fabricated with this new light source, the fabrication methods and facilities that are required, and work that already is underway at Monash University and elsewhere to exploit the many advantages of this new facility for the development of novel photonic devices.