ABOUT THE COVER

PhD students Andrew Lee and Martin Ams, from CUDOS / CLA at Macquarie University, are developing direct-write methods for fabricating 2-D photonic crystal circuits and single mode waveguides in bulk materials using a Spectra-Physics Hurricane femtosecond Ti:Sapphire laser system recently installed by Lastek Pty. Ltd. Inset shows a scanning electron micrograph of a 2-D photonic crystal structure with a missing pillar illustrating the control offered with this technique.

Photonic crystals are artificial 1-, 2- or 3-D periodic structures with unit cells similar in size to the wavelength of light. Worldwide there is a great deal of interest in these structures because photons can be guided and manipulated on microscopic scale. Indeed, these devices are predicted to revolutionise optical telecommunications and many areas of optical signal processing.

Photonic crystals are made using a range of techniques, however, many of these techniques are poorly suited to the fabrication of photonic crystal circuitry in which the periodic nature of generic photonic crystals is locally altered by the insertion of defects to introduce waveguiding capability, and other complex functionalities such as coupling, switching and resonant filtering. The micro-fabrication group at Macquarie University, incorporating a node of the Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS) within the Centre for Lasers and Applications (CLA) under the leadership of Dr Michael Withford, Associate Professor Judith Dawes and Professor Jim Piper, are developing novel direct-write laser processing techniques suitable for rapid prototyping of photonic crystal circuitry. The Spectra Physics Hurricane femtosecond laser has enabled the Macquarie University team to fabricate 2-D periodic structures containing regularly spaced air gaps and raised pillars on a sub-micron scale. The new femtosecond laser also supports a number of other projects pursued by this team such as laser direct-writing of single mode waveguides inside bulk glasses and nano-machining of materials.