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Judith Dawes

Associate Professor Judith Dawes' research targets the control of light at the nano scale using plasmonics, nanoparticles and photonic crystals. Throughout her professional career, her research has focused on lasers, most recently the polarisation dynamics of solid state lasers and optical applications in biology and medicine. She teaches Physics and Photonics at Macquarie University and is the Department Director of Higher Degree Research students. She gained her BSc (Honours) and PhD from The University of Sydney, and also spent a year at the Laboratory for Laser Energetics and Department of Physics, University of Rochester with a Rotary International Fellowship. After postdoctoral research at the University of Toronto, Canada, she returned to Australia, taking up an appointment in the Department of Physics at Macquarie University.

Key Areas of Research Contribution

A/Prof Judith Dawes contributes to the Nanoplasmonics and Functional Metamaterials projects within CUDOS, with a particular interest in developing amplification schemes to compensate for absorption losses in metallic nanostructures. Her PhD student Alireza Maleki has recently joined CUDOS working in the area of nanoplasmonics.

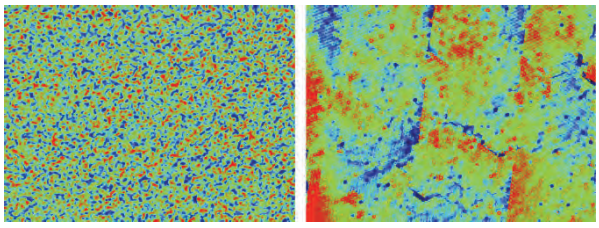
2011 Achievements

The CUDOS group at Macquarie have been developing near field scanning optical microscope characterisation for observing surface plasmons, with the expertise of newly appointed postdoctoral fellow Dr Thanh Phong Vo. With experimental assistance from Dr James Downes (MQ Photonics) and internship students Franziska Kleye and Julia Zahn, planar gold waveguides on silica substrates were fabricated for initial characterisation of surface plasmons, and surface plasmon resonances were observed using the Otto geometry. The research group fabricated and gold-coated silica and polystyrene opals to create 2D diffraction gratings, and observed surface plasmon resonances in these structures. They aim to observe propagation and interaction of surface plasmons in the gold-coated gratings.

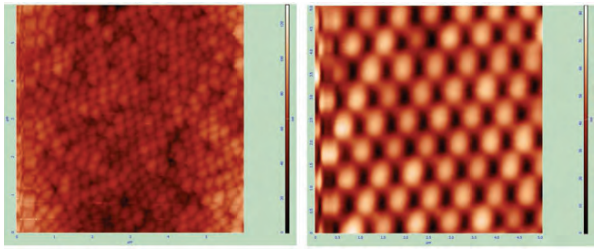
Research on functionalising 3D photonic crystals continued with internship students Michaela Micko and Matthias Brendle investigating silver-infiltrated opals for the Functional Metamaterials project as well as opal-covered tapered optical fibres. They were able to create silvered photonic crystals with reflection and transmission spectra consistent with the expected enhancement in the silica opal stop-gap. PhD student Faraz Inam studied the radiation dynamics of nitrogen-vacancy emission from nano-diamonds on structured surfaces, which exhibits counter-intuitive features. Research with MPhil graduate Dionne Haynes on focal ratio degradation in optical fibres for astronomy was completed during 2011.

Recognition

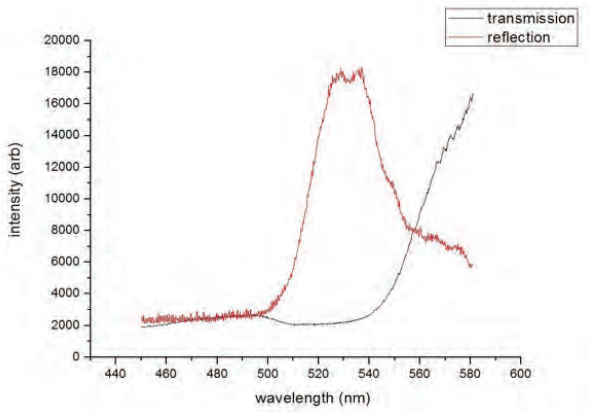
A/Prof Dawes was elected President of the Australian Optical Society for 2010-2012. She has served on the Editorial Board of the Optical Society of America's members' magazine, *Optics and Photonics News* for 2009-2011. Other professional activities include serving as Member of Applications of the Nonlinear Optics Subcommittee of CLEO USA 2009-2011, and Member of the Lasers Subcommittee, CLEO Pacrim 2011, Sydney, Australia. She is also a Member of the Local Organising Committee for the 20th Australian Institute of Physics Congress and Australian Conference on Optical Fibre Technology in Sydney to be held in 2012. In addition to her research role in CUDOS, Judith Dawes is the Outreach Coordinator for CUDOS, and co-chairs the Outreach and Education Committee of CUDOS.



Left: White light interferometer image of Silica opaL and right: Polystyrene opal.



Left: Atomic force micrograph of Silica opal and Right: Polystyrene opal.



Transmission and reflection spectra for silver-coated silica opal, showing red-shifted, broadened stopgap.

References

1. DM Haynes, MJ Withford, JM Dawes, JS Lawrence, R Haynes, "Relative contributions of scattering, diffraction, and modal diffusion to focal ratio degradation in optical fibres" Monthly Notices of Royal Astronomical Society, 414, 253-263 (2011)
2. FA Inam, T Gaebel, C Bradac, L Stewart, MJ Withford, JM Dawes, MJ Steel, JR Rabeau, "Modification of spontaneous emission from nanodiamond colour centres on a structured surface" New J Physics, 13, 073012 (2011)
3. F Inam, T Gaebel, C Bradac, L Stewart, M Withford, J.M. Dawes, M.J. Steel, J.R. Rabeau "Spontaneous emission from nanodiamond NV colour centres on structured surfaces" CLEO, Baltimore USA, May 2011.
4. G. Mariën, N. Cvetojevic, N. Jovanovic, J. Dawes, R. Haynes, J. Lawrence, Q. Parker, and M. Withford; Fibre Bragg Grating Stopband for Temporal Spectral Astronomy CLEO Europe Munich June 2011.
5. M. K. Micko, M. Brendle, J.M. Dawes "Direct Opal Fabrication From Silver-coated Silica Microspheres" CLEO Europe Munich, June 2011.
6. M Brendle, M Micko, M Pasch, E Magi, JM Dawes, "Functionalising opals: versatile self-assembled photonic crystal devices" CLEO Pacific Rim Sydney, September 2011
7. FA Inam, T Gaebel, C Bradac, L Stewart, MJ Withford, JM Dawes, MJ Steel, JR Rabeau, "Characterisation of the influence of crystal size and dipole orientation on the spontaneous emission lifetime of diamond NV colour centres" CLEO Pacific Rim Sydney September 2011.