Proceedings of the 35th Annual Condensed Matter and Materials Meeting

2011

Charles Sturt University

Wagga Wagga NSW

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Editor: Adam Micolich

The 35th Annual Condensed Matter and Materials Meeting was held at the Charles Sturt University campus in Wagga Wagga NSW from the 1st to the 4th of February 2011. The conference was attended by 92 delegates from a range of universities across Australia and New Zealand, and countries as distant as Turkey.

There were a total of 9 invited and 21 contributed talks during the three days of scientific sessions, as well as two poster sessions with a total of 49 poster presentations. The conference also featured a number of very enjoyable social sessions including the annual trivia quiz, with "*No Idea*"* winning the Lindsay Davis cup in this year's competition.

All presenters were invited to submit a manuscript for publication in the conference proceedings. The length limits where six pages for invited papers and four pages for contributed papers.

Each manuscript was reviewed by two anonymous referees who worked to a set of guidelines made available by the editor. Each accepted publication therefore satisfies the requirements for classification as a refereed conference publication (E1).

The organizers would like to thank the 21 reviewers for their time and effort in reviewing manuscripts, which resulted in 18 papers being accepted for publication. The accepted manuscripts are available at the online publication section of the Australian Institute of Physics national web site (http://www.aip.org.au/).

Wagga 11 Organising Committee: Jaan Oitmaa, Chris Hamer, Clemens Ulrich, Adam Micolich, Marion Stevens-Kalceff, Oleg Sushkov, Alex Hamilton, Michelle Simmons.

Correspondence: mico@phys.unsw.edu.au

Date: 28 June 2011

Team members: Maciej Bartkowiak, Paul Gubbens, Chris Hamer, Stephen Harker, Annamieke Mulders, Jeff Sellar, Supitcha Supansomboon and Clemens Ulrich.

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22	Paper F2 – *Crystal Structure of* Cu_5SbO_6 *– Synchrotron and Neutron Diffraction Studies*, E. Rey, P.-Z. Si and T. Söhnel.
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74 Paper TP9 – *Does the Quantum Compass Model in Three Dimensions have a Phase Transition?*, J. Oitmaa and C.J. Hamer.

78 Paper TP10 – *Scaling of Critical Temperature and Ground State Magnetization near a Quantum Phase Transition*, J. Oitmaa and O.P. Sushkov.

82 Paper TP19 – *Ultra-high Molecular Weight Polyethylene Prosthetic Wear Debris Transport in a Wheel-on-Plate Model System*, J.A. Warner, L.G. Gladkis, A.E. Kiss, J. Young, P.N. Smith, J. Scarvell, C.C. O'Brien and H. Timmers.

WW2011 SCIENTIFIC PROGRAM

Wednesday Morning, 2 February

08:45 – 09:00		**Opening: *J. Oitmaa, UNSW***	
09:00 – 10:30	**W-I**	**Chairperson: *G.A. Stewart, Australian Defense Force Academy***	
09:00 – 09:30	W1	100 Years of Superconductivity, 25 Years of HTS *J.L. Tallon, MacDiarmid Institute, Lower Hutt, New Zealand*	*INVITED*
09:30 – 10:00	W2	Superconductivity: From Zero Resistance to Terahertz Devices *J.C. Macfarlane, CSIRO Materials Science and Engineering*	
10:00 – 10:30	W3	The Australian Synchrotron and condensed matter science *D.J. Cookson, Australian Synchrotron*	*INVITED*
10:30 – 10:50		**Morning tea**	
10:50 – 12:20	**W-II**	**Chairperson: T. Soehnel, University of Auckland**	
10:50 – 11:20	W4	Compound Semiconductor Nanowires for Next Generation Optoelectronic Devices *C. Jagadish, The Australian National University*	*INVITED*
11:20 – 11:40	W5	Terahertz generation from high index GaAs planes at different angles of incidence *K. Radhanpura, University of Wollongong*	
11:40 – 12:00	W6	Nitrogen Doping and In-situ Heat Treatment of Carbon Nitride Thin Films *D.W.M. Lau, University of Melbourne*	
12:00 – 12.20	W7	Single dopant transport spectroscopy in silicon *J. Verduijn, S. Rogge, Delft University of Technology, UNSW*	
12:20 – 14.00		**Lunch**	
14:00 – 15:30	**W-III**	**Chairperson: *M.B. Cortie, University of Technology Sydney***	
14:00 – 14:30	W8	Engineered quantum systems *G. Milburn, University of Queensland*	*INVITED*
14:30 – 14:50	W9	Vacancies and Void Formation near Si/SiO_2 Interface *R. Weed, The Australian National University*	
14:50 – 15:10	W10	Nd-Eu magnetic interactions in Nd^{3+}:$EuCl_3.6H_2O$ *R.L. Ahlefeldt, The Australian National University*	
15:10 – 15:30	W11	Closing the gap: The influence of relativistic effects on the band structure of HgSe and HgTe *S. Biering, Massey University Albany*	
15:30 – 16:00		**Afternoon Tea**	
16:00 – 18:00		**Poster Session: WP1 – WP25**	
18:30 – 22:00		**Conference Dinner**	

Thursday Morning, 3 February

09:00 – 10:30	**T-I**	**Chairperson: *O.P. Sushkov, UNSW***
09:00 – 09:30	T1	Magnetic domain wall dynamics: from inkblots to spin torque *INVITED* *P.J. Metaxas, University of Western Australia*
09:30 – 09:50	T2	Inelastic Neutron Scattering and EPR Studies of Cobalt Dimers *R.A. Mole, ANSTO, The Bragg Institute*
09:50 – 10:10	T3	Structural and magnetic phase separation in $PrMn_2Ge_{2-x}Si_x$ compounds *J.L. Wang, S.J. Kennedy, University of Wollongong, ANSTO*
10:10 – 10:30	T4	Temperature dependence of the spontaneous remagnetization in $Nd_{60}Fe_{30}Al_{10}$ and $Nd_{60}Fe_{20}Co_{10}Al_{10}$ bulk amorphous ferromagnets *S.J. Collocott, CSIRO Materials Science and Engineering*
10:30 – 10:50		**Morning tea**
10:50 – 12:30	**T-II**	**Chairperson: *K.-D. Liss, The Bragg Institute / ANSTO***
10:50 – 11:20	T5	Engineering graphene growth *INVITED* *N. Medhekar, Monash University*
11:20 – 11:40	T6	101 uses for the nitrogen-vacancy centre in diamond *N. Manson, Australian National University*
11:40 – 12:00	T7	Hard-ball modelling of BCC to closest-packed transition in nanoscale shape memory alloy actuators *M.B. Cortie, University of Technology Sydney*
12:00 – 12.30	T8	Structural variety in brownmillerite-type materials *INVITED* *H. Krüger, The Australian National University, University of Innsbruck*
12:30 – 14.00		**Lunch**
14:00 – 15:30	**T-III**	**Chairperson: *A.J. Hill, CSIRO Materials Science and Engineering***
14:00 – 14:20	T9	The structure of Yttria-Stabilized Zirconia: A combined medium energy photoemission and ab-initio investigation *G. Cousland, The University of Sydney*
14:20 – 14:40	T10	Positron Annihilation Lifetime Spectra of Radiation Damage, Neutral Zircon Crystals *J. Roberts, The Australian National University*
14:40 – 15:00	T11	Experimental study of diffusion and clustering in aluminum alloys *M.D.H. Lay, CSIRO Material Science and Engineering*
15:00 – 15:20	T12	Neutrons and Li-Ion Batteries *N. Sharma, ANSTO, The Bragg Institute*
15:20 – 15:50		**Afternoon Tea**
16:00 – 18:00		**Poster Session: TP1 – TP24**
18:00 – 19:00		**Dinner**
20:00 – 22:30		**Trivia Quiz, Conference Centre** *Quizmaster: Trevor Finlayson, University of Melbourne*

Friday Morning, 4 February

09:00 – 10:30	**F-I**	**Chairperson: *S.J. Collocott, CSIRO Materials Science and Engineering***
09:00 – 09:30	F1	Advanced resonant X-ray diffraction applied to the study of ordering phenomena in complex oxides *INVITED* *A.M. Mulders, Australian Defense Force Academy @UNSW*
09:30 – 09:50	F2	Cu_5SbO_6 – Synchrotron, Neutron Diffraction Studies and Magnetic Properties *T. Söhnel, The University of Auckland*
09:50 – 10:10	F3	Comparison investigation for flux pinning of Titanium and Zirconium doped $Y_1B_2C_3O_{7-\delta}$ films prepared by TFA-MOD *Q. Li, University of Wollongong*
10:10 – 10:30	F4	Diffuse scattering from PZN ($PbZn_{1/3}Nb_{2/3}O_3$) *R.E. Whitfield, The Australian National University*
10:30 – 10:50		**Morning tea**
10:50 – 12:00	**F-II**	**Chairperson: *R.A. Lewis, University of Wollongong***
10:50 – 11:20	F5	Multilayered Water-Based Organic Photovoltaics *A. Stapleton, P.C. Dastoor, University of Newcastle* *INVITED*
11:20 – 11:40	F6	Study on the interface between organic and inorganic semiconductors *A.-U. Rehman, Zhejiang University, China*
11:40 – 12:00	F7	Slow photon photocatalytic enhancement in titania inverse opal photonic crystals *V. Jovic, G.I.N Waterhouse, The University of Auckland, Auckland*
12:00 – 12:20		**Presentations and Closing**
12:20 – 14.00		**Lunch**

POSTER SESSION: Wednesday 2 February

WP1 A.A. Abiona, W.J. Kemp, A.P. Byrne, M. Ridgway, and H. Timmers
Possible Pb-vacancy pairing in germanium: Dependence on doping and orientation

WP2 J.G. Bartholomew, S. Marzban, M.J. Sellars, and R.-P. Wang
Coherence properties of rare earth ion doped thin films

WP3 M. Bartkowiak, G.J. Kearley, M. Yethiraj, and A M Mulders
Ab initio determination of the structure of the ferroelectric phase of $SrTi^{18}O_3$

WP4 T.J. Bastow, C.R. Hutchinson, A. Deschamps, and A.J. Hill
Precipitate growth in a mechanically stressed (deformed) Al(Cu,Li,Mg,Ag) alloy observed by ^{7}Li, ^{27}Al, and ^{63}Cu NMR and XRD

WP5 J. Bertinshaw, T. Saerbeck, A. Nelson, M. James, V. Nagarajan, F.Klose, and C. Ulrich
Studying multiferroic $BiFeO_3$ and ferromagnetic $La_{0.67}Sr_{0.33}MnO_3$ tunnel junctions with Raman spectroscopy and neutron scattering techniques

WP6 J.D. Cashion, W.P. Gates, T.L. Greaves, and O. Dorjkhaidav
Identification of Fe^{3+} site coordinations in NAu-2 Nontronite

WP7 W. Chen and O.P. Sushkov
Fermi arc – hole pocket dichotomy: effect of spin fluctuation in underdoped cuprates

WP8 E. Constable and R.A. Lewis
Continuous-wave terahertz spectroscopy as a non-contact, non-destructive method for characterising semiconductors

WP9 M. de los Reyes, K.R. Whittle, M. Mitchell, S.E. Ashbrook, and G.R Lumpkin
Pyrochlore-fluorite transition in $Y_2Sn_{2-x}Zr_xO_7$ - implications for stability

WP10 B. Deviren, S. Akbudak, and M. Keskin
Mixed spin-1 and spin-3/2 Ising system with two alternative layers of a honeycomb lattice within the effective-field theory

WP11 J.B. Dunlop, T.R. Finlayson, and P. Gwan
Condensed matter and materials trivia

WP12 C. Feng, H. Li, G. Du, Z. Guo, N. Sharma, V.K. Peterson, and H. Liu
Non-stoichiometric Mn doping in olivine lithium iron phosphate: structure and electrochemical properties

WP13 T.R. Finlayson, S. Danilkin, A.J. Studer, and R.E. Whitfield
Anomalous precursive behaviour for the martensitic material $Ni_{0.625}Al_{0.375}$

WP14 L.G. Gladkis, H. Timmers, J.M. Scarvell, P.N. Smith
Reliable shape information on prosthesis wear debris particles from atomic force microscopy

WP15 C.J. Hamer, O. Rojas, and J. Oitmaa
A frustrated 3D antiferromagnet: stacked J_1-J_2 layers

WP16 S.J. Harker, H. Okimoto, G.A. Stewart, K. Nishimura, and W.D. Hutchison
An ^{57}Fe-Mossbauer study of the magnetic phase diagram for $Nb_{1-x}Hf_xFe_2$

WP17 B. Hillman, D. James, J. Dong, W.D. Hutchison, D.J. Goossens
Structural Properties of Compounds in the M$PS_{3-x}Se_x$ *Family*

WP18 M. Holt and O.P. Sushkov
Mobile hole dynamics in the vicinity of an O(3) quantum critical point

WP19 J.M. Hudspeth, D.J. Goossens, and T.R. Welberry
Modelling short-range order in triglycine sulphate

WP20 W.D. Hutchison, P.G. Spizzirri, F. Hoehne, L.Y.S. Soo, L.K. Alexander, and M.S. Brandt
Studies of near surface phosphorus donors in silicon via electrically detected magnetic resonance

WP21 P. Imperia
New sample environments and science opportunities at the Bragg Institute

WP22 W.J Kemp, A.A. Abiona, P. Kessler, R. Vianden, H. Timmers
Time differential perturbed angular correlation spectroscopy of ^{100}Pd/Rh in Rhenium and Hafnium

WP23 Withdrawn

WP24 Y. Kulik and O.P. Sushkov
Decay width of longitudinal magnon in the vicinity of an O(3) quantum critical point

WP25 P.S. Lavers
Topological atoms in crystals and their role in crystalline bonds

POSTER SESSION: Thursday 3 February

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Proximity effect on ion track etching in amorphous SiO_2

TP2 T. Li, O.P. Sushkov, and U. Zuelicke
Spin dynamics and Zeeman splitting of holes in a GaAs point contact

TP3 K.-D. Liss, D.D. Qu, M. Reid, and J. Shen
On the atomic anisotropy of thermal expansion in bulk metallic glass

TP4 Y. Liu and H. Timmers
Possible lubrication and temperature effects in the microscratching of polyethylene terephthalate

TP5 A. E. Malik, W.D. Hutchison, K. Nishimura, and R.G. Elliman
Studies of magnetic nanoparticles formed in SiO_2 by ion implantation

TP6 J. Mao, Z. Guo, and H. Liu
Effect of hydrogen back pressure on de/rehydrogenation behaviour of $LiBH_4$-MgH_2 system and the role of additive toward to enhanced hydrogen sorption properties

TP7 A.P. Micolich, K. Storm, G. Nylund, and L. Samuelson
Chemical control of gate length in lateral wrap-gated InAs nanowire FETs

TP8 J. Oitmaa and A. Brooks Harris
High temperature thermodynamics of the multiferroic $Ni_3V_2O_8$

TP9 J. Oitmaa and C.J. Hamer,
Does the quantum compass model in 3D have a phase transition?

TP10 J. Oitmaa and O.P. Sushkov
Scaling of critical temperature and ground state magnetization near a quantum phase transition

TP11 L.J. Rogers, K.R. Ferguson, and N.B. Manson
Strain to selectively excite certain orientations of NV centres in diamond

TP12 S. Sakarya, P.C.M. Gubbens, A. Yaouanc, P. Dalmas de R´eotier, D. Andreica, A. Amato, U. Zimmermann, N. H. van Dijk, E. Brück, Y. Huang, T. Gortenmulder, A. D. Hillier, and P. J. C. King
Ambient and high pressure μSR measurements on the ferromagnetic superconductor UGe_2

TP13 A. Sokolova
Small Angle Scattering: instrumentation and applications to study various materials at the nanoscale

TP14 G.A. Stewart, H. Salama, A. Mulders, D. Scott, and H.StC. O'Neill
Thermal hysteresis of the ^{169}Tm quadrupole interaction in orthorhombic thulium manganite

TP15 S. Supansomboon, A. Dowd, and M.B. Cortie
Phase relationships in the $PtAl_2$-$AuA1_2$ system

TP16 W. X. Tang, C. X. Zheng, Z. Y. Zhou, D. E. Jesson, J. Tersoff
Surface dynamics during Langmuir evaporation of GaAs

TP17 G.J.Troup, D.R.Hutton, J.Boas, A.Casini, M.Picollo, and Robyn Slogget
From radiation damage, through minerals and gemstones, to art with EPR

TP18 J.L. Wang, A.J. Studer, S.J. Campbell, S.J. Kennedy, R. Zeng, and S.X. Dou
Magnetic structures of $Pr_{1-x}Lu_xMn_2Ge_2$ compounds (x = 0.2 and 0.4)

TP19 J.A. Warner, L.G. Gladkis, A. E. Kiss, J. Young P.N. Smith, J. Scarvell, and H.Timmers
Polymer particle production and dispersion in Knee prostheses

TP20 K.R. Whittle, D.P. Riley, M.G. Blackford, R.D. Aughterson, S. Moricca, G.R. Lumpkin, and N.J. Zaluzec
$M_{(n+1)}Ax_n$ Phases are they tolerant/resistant to damage

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TP22 P. Zhang, Z. Guo, and H. Liu
Electrospinning technology used to synthesize nanomaterials for lithium ion batteries

TP23 C.X. Zheng, Z.Y. Zhou, W.X. Tang, D.E. Jesson, J. Tersoff, and B. A. Joyce
Design and application of a III-V surface electron microscope

TP24 C. Zhong, J.Z. Wang, S.L. Chou, K. Konstantinov and H.K. Liu
Spray pyrolysis prepared hollow spherical CuO/C: synthesis, characterization, and its application in lithium-ion batteries