

Dr. Mark Platt

Lecturer in Analytical Chemistry

Chemistry Department, Loughborough University, Loughborough, LE11 3TU

m.platt@lboro.ac.uk 01509 222573

Awards and Affiliations

Ireland's "Champions of Research" (2012)

Marie Curie Research Career Integration Grant (2012)

Member of the Royal Society of Chemistry, MRSC

Member of the American Chemical Society

Marie Curie Research Fellow, IEF (2010)

First prize: North West Prize Colloquium Physical Chemistry (2004)

Precious Metals Institute Award for outstanding work (2003)

Margaret Elizabeth Lee travel studentship (2002 & 2003), University of Manchester

Royal Society of Chemistry Award for Analytical Chemistry (1999), University of Salford

Research funding

PI - Marie Curie Fellowship IEF	Assay for Biomarkers FP7-252935	05/2010 – 03/2012	€177,374
PI - Marie Curie Career Integration Grant	Nano4Bio FP7- 321836	10/2012 – 09/2016	£83,287
PI - Izon Inc PhD Studentship	Resistive pulse sensing for Viruses	10/2013- 10/2016	£121,985
PI - EPSRC Small equipment grant	Microfluidics	06/2012	£15,000
Member of the LU group – EPSRC	Decommissioning, Immobilisation, and Storage for Nuclear waste	06/2014	£6.1M

Education

- Ph.D., **The University of Manchester** 2001 – 2004

Supervisor: Prof R. A. W. Dryfe, "*Controlled deposition at the liquid-liquid interface*"

- MChem., **University of Salford**,
1997-2001 Chemistry with Analytical Chemistry, 1.1

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Research Summary & Career

My research combines aspects of electrochemistry, high affinity capture probes and nanotechnology to create a new technique capable of capturing biomarkers directly within biological samples. Notable achievements to date include:

- Over 325 citations, 28 papers, 3 patents and a book chapter.
- Cover article on the Journal Small
- Co-developing the aptamer synthesis procedure CLADE
- Securing patents on aptamer sensors and magnetic particle applications
- Speaking at a Singapore conference by invitation of the British high commission
- Marie Curie Intra-European and Career integration grants

University College Dublin – Marie Curie Research Fellow

June 2010 – Feb 2012

Research: A new analytical technique capable of screening biomarkers directly from biological samples was developed. The technique involved synthesizing asymmetrical nanoparticles using template electrodeposition. The particles contain a magnetic property which was then functionalized through a specific surface chemistry protocol, with aptamers (single strand DNA) capable of capturing the protein target with high affinity and specificity. The particles were designed to form aggregates in the presence of the target analyte, and using the nanopore detection platform (IZON) the size, shape and morphology of the particles are monitored.

Responsibilities: Co-mentor 2 Ph.D. students, supervise undergraduate projects. Lecture undergraduate and graduate students. Research coordinator for particle synthesis and surface chemistry for the Bionanoscience group.

University College Dublin – Postdoctoral Fellow

Aug 2009 – May 2010

Nonlinear magnetophoresis, NLM, is a technique capable of selectively separating superparamagnetic particles from complex media based upon their size and magnetic properties. My role within the group was to liaise with both the assay development and device fabrication teams and to synthesize new superparamagnetic beads for the detection of analytes.

University of Manchester - Research Associate

Oct 2006 – July 2009

Closed loop aptameric directed evolution, CLADE, involved working alongside a team of computational chemists. My role was to run, perform and analyze the wet part of the project which included chip synthesis, protein labeling, hybridization and preliminary data analysis. CLADE was a new method using DNA microarrays for generating aptamers suitable for diagnostic and sensor applications. The technology platform allowed both electrochemical and fluorescent based detection technologies to be explored. Binding characteristics of new aptamers were characterized using SPR and FCS. Other techniques such as FTIR, MALDI and SIMS were also investigated for novel tagless detection mechanisms.

Responsibilities: Coordinator for the CLADE research accounts. Maintenance and running of DNA microarray synthesiser.

University of Cambridge - Research Associate

Nov 2005 – July 2006

Microfluidic devices were made via photolithography, the devices were designed to allow the controlled and detailed study of nanoparticle formation.

Penn State University - Research Associate

Nov 2004 – Nov 2005

My research involved the synthesis and attachment of Cobalt Ferrite nanoparticles to tubulin microtubules via biological linker molecules e.g. DNA and the biotin and neutravidin interaction. The attachment allowed the microtubule orientation to be manipulated and controlled on kinesin motor surfaces using an externally applied magnetic field, producing ordered microtubule arrays. This work showed the first facile control of microtubule movement.

University of Manchester - Graduate Student

Oct 2001 to Oct 2004

My thesis contained a detailed study on the nucleation and growth of metal particles. The research was unique due to the method chosen to study the particle formation, namely the liquid-liquid interface. This technique allows the electrochemical study of particle formation without the influence of the underlying electrode. The main results from this study include a new template deposition technique, a simplified method to study particle formation, and the first reported co-deposition of palladium and platinum at the ITIES.

Teaching experience

Module Leader: CMA011 Introduction to Analytical Chemistry , CMP067 Sensors for Health and the Environment, CMP065 Research projects

Lecturer: CMB015 Separation Techniques, CMD032 Advanced Analytical Chemistry, CMP064 Innovations in Analytical Science, CMP056 Research training

Student Supervision

Ph.D. Student (Current students)

Chen Hu (Loughborough University and Nanyang Technological University)

Emily R. Billinge (Loughborough University) “Smart Materials for the detection of biomarkers”

Emma Blundell (Loughborough University) “Resistive pulse sensing for the detection of Viruses”

James O’Mahoney (UCD) “*superparamagnetic microparticle synthesis*”.

Masters Student

Paul Mallee (Sept 2011 – July 2012 UCD) “*Chemical synthesis of biocompatible surfaces*”

Commercial activity

Consulting

Magsense Inc

- Design and implementation and production of particles in Ireland

Patent application submitted

J. O’Mahony, M. Platt, G. U Lee *Hollow / porous superparamagnetic microspheres*.

Patents

P. Li, M. Platt, G. Cannon, G. U. Lee. *Non-linear magnetophoretic separation device, system and method*. Patent application PCT/EP2011/061550.

M. Platt, G. U. Lee *Detection of biomarkers using nanopore and nanorod technology*

Information Dissemination

Invited Speaker

MRC Human Nutrition Research, Cambridge, 2013

“Materials for tomorrow” UK-Singapore workshop, Hosted by the British high commission, Singapore, 2012

“Tunable nanopore sensors” Oxford Science Park, Oxford, 2012

Conference Presentations

Oral –. Recently Appointed Lecturers in Physical Chemistry, Durham, 2012, Electrochem 2011, Bath, 2011. Gordon Conference, Electrodeposition New Hampshire, 2004. The RSC and SCI NorthWest Colloquium Meeting, Liverpool 2004. International Society of Electrochemistry meeting, Sao Paulo, 2003. North West Electrochemistry meeting, Liverpool, 2003. Electrochemistry meeting UMIST, Manchester, 2003. RSC Analytical Forum, London, 2002.

Publications – 326 citations, h-index 12

24 -Steve H. Faulkner, Kate Spilsbury, James Harvey, Andrew Jackson, Jingfeng Huang, Mark Platt, Alfred Tok and Myra A. Nimmo - article submitted.

23 - E. Billinge, M. Broom, M. Platt, Article accepted.

22 - J. O’Mahony, D. Kilinc, M. Platt, G. Lee, "Synthesis of Superparamagnetic Particles with Tunable Morphologies: The Role of Nanoparticle–Nanoparticle Interactions" *Langmuir* (2013) 29, 2546

21 - E. Billinge, J. Muzard, M. Platt, "Tunable resistive pulse sensing as a tool to monitor analyte induced particle aggregation", *Nanomaterials and Nanosciences*, (2013)

20 - M. Platt, G. Willmott, G. U. Lee, "Resistive pulse sensing of analyte-induced multicomponent rod aggregation using tunable pores", *Small*, (2012) 8, 2436-2444

- 19 - J. Muzard, M. Platt, G. U. Lee, "Design and characterization of M13 virus-activated superparamagnetic particles" *Small* (2012) 8, 2289.
- 18 - G. Willmott, M. Platt, G. U. Lee "Resistive pulse sensing of magnetic beads and supraparticle structures using tunable pores" *Biomicrofluidics*, (2012), 6, 014103.
- 17 - M. Platt, W. Rowe, D. C. Wedge, P. J. R. Day, D. B. Kell, J. Knowles, "Convergent evolution to an aptamer observed in small populations on DNA microarrays" *Phys. Biol.* (2010) 7, 036007.
- 16 - W. Rowe, D. C. Wedge, M. Platt, D. B. Kell, J. Knowles, "Predictive models for population performance on real biological fitness landscapes" *Bioinformatics*, (2010), 26, 2145.
- 15 - M. Platt, W. Rowe, D. C. Wedge, P. J. R. Day, D. B. Kell, J. Knowles, "Analysis of a complete DNA-protein affinity landscape" *J. Royal Soc. Interface*, (2010) 7, 397.
- 14 - M. Platt, W. Rowe, J. Knowles, P. J. R. Day, D. B. Kell, "Analysis of aptamer sequence activity relationships" *Integrative Biology*, (2009) 1, 116.
- 13 - C.K. Knight, M. Platt, W. Rowe, D. C. Wedge, F. Khan, P. J. R. Day, A. McShea, J. Knowles, D. B. Kell, "Array-based evolution of DNA aptamers allows modelling of an explicit sequence-fitness landscape" *Nucleic Acids Research*, (2009) 37, e6.
- 12 - M. Platt, W. Rowe, D. C. Wedge, J. Knowles, P. J. R. Day, D. B. Kell, "Aptamer evolution for array-based diagnostics" *Analytical Biochemistry*, (2009) 390.
- 11 - M. E. Williams, B. M. Hutchins, M. Platt, W. O. Hancock, *ECS Transactions* (2007) 3, 1.
- 10 - B. M. Hutchins, M. Platt, W. O. Hancock, M. E. Williams, "Directing transport of CoFe₂O₄-functionalized microtubules with magnetic fields" *Small* (2007) 3, 126.
- 9 - M. Platt, R. A. W. Dryfe, "Electrodeposition at the liquid/liquid interface: The chronoamperometric response as a function of applied potential difference" *J. Electroanal. Chem.* (2007) 599, 323.
- 8 - B. M. Hutchins, M. Platt, W. O. Hancock, M. E. Williams, "Motility of CoFe₂O₄ nanoparticle-labelled microtubules in magnetic fields" *Micro and Nanoletters*, (2006) 1, 47.-
- 7 - M. Platt, G. Muthukrishnan, W. O. Hancock, M. E. Williams, "Millimetre scale alignment of magnetic nanoparticle functionalized microtubules" *J. Am. Chem. Soc.* (2005) 127, 15686.
- 6 - M. Platt, R. A. W. Dryfe, "Structural and electrochemical characterisation of Pt and Pd nanoparticles electrodeposited at the liquid/liquid interface: Part 2" *Phys. Chem. Chem Phys.*, (2005) 7, 1.
- 5 - M. Platt, R. A. W. Dryfe, E. P.L. Roberts, "Structural and electrochemical characterisation of Pt and Pd nanoparticles electrodeposited at the liquid/liquid interface" *Electrochim Acta*, (2004) 49, 3937.
- 4 - M. Platt, R. A. W. Dryfe, E. P.L. Roberts, "Electrodeposition of palladium nanoparticles at the liquid-liquid interface using porous alumina templates" *Electrochim Acta*, (2003) 48, 3037.
- 3 - M. Platt, R. A. W. Dryfe, E. P.L. Roberts, "Voltammetry with liquid/liquid microarrays: Characterization of membrane materials" *Langmuir*, (2003) 19, 8019.
- 2 - A. Sherburn, M. Platt, D. W. M. Arrigan, N. M. Boag, R. A. W. Dryfe, "Selective silver ion transfer voltammetry at the polarised liquid vertical bar liquid interface" *Analyst* (2003) 128, 1187.
- 1 - M. Platt, R. A. W. Dryfe, E. P.L. Roberts, "Controlled deposition of nanoparticles at the liquid-liquid interface" *Chem Comm*, (2002) 20, 2324.

Review articles and book chapters

- 1 - W. Rowe, M. Platt, P. J. R. Day. "Advances and perspectives in aptamer arrays" *Integrative biology*, (2009) 1, 53.
- 2 - D. Ayers, M. Platt, F. Javad, P. J. R. Day. (2011) Human papilloma virus strain detection utilising custom-designed oligonucleotide microarrays. *PCR mutation and detection Protocols, Methods Mol Biol*, 688, 20

Conference proceedings

- 2 - J. Muzard, M. Platt, G. U. Lee, ACS San Diego 2012.
- 1 - M. E. Williams, B. M. Hutchins, M. Platt, W. O. Hancock, G. Muthukrishnan, ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY Volume: 230 Pages: U369-U369