

Dr Adnan Mehonic

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RESEARCH EXPERIENCE & SKILLS

Lecturer at the Department of Electronic & Electrical Engineering, UCL

- Member of the Electronic Materials & Devices Group

Royal Academy of Engineering Research Fellow, “Next generation adaptive electronics for neuromorphic engineering”, from 9/2017

- Development of neuromorphic system based on nanoelectronic resistance switching devices

Research Associate, Department of Electronic & Electrical Engineering, UCL 2013 2017 (EPSRC EP/K01739X/1 & EP/P013503/1)

- Development of silicon-oxide based resistance switching technology
- Fabrication of Resistive RAM (RRAM) devices: Sputtering, Plasma Enhanced Chemical Vapour Deposition, Thermal & e-beam Evaporation, Photolithography
- Electrical characterisation of RRAM devices
- Chemical & structural characterisation of RRAM devices: Atomic Force Microscopy (AFM), Conductive AFM, Scanning Tunnelling Microscopy, X-ray Photoelectron Spectroscopy, Raman Spectroscopy, Fourier Transform Infra-Red Spectroscopy, Secondary ion mass spectrometry
- Development of Matlab Monte Carlo phenomenological models and circuit device models
- Publishing of scientific papers in peer-reviewed journals (+ a book chapter) and attendance & presentation of results at international meetings including five invited talks (Material Research Society & European Material Research Society meetings, COST meetings, IEEE conference)

PhD Research, Department of Electronic & Electrical Engineering, UCL

10/2010 1/2014

- Demonstration of the first ambient working metal-free silicon oxide RRAM device
- Understanding of underpinning physics governing resistance switching
- Publishing of scientific papers in peer-reviewed journals and attendance and presentation of results at international meetings (Material Research Society, European Material Research Society)

EDUCATION

PhD Student, Department of Electronic & Electrical Engineering, UCL, 2010-2014

- Doctoral Thesis: Resistive Switching in Silicon-rich Silicon Oxide

MSc in Nanotechnology (with Distinction), Department of Electronic & Electrical Engineering, UCL, 2009-2010

- MSc Thesis: Current transport studies of silicon nanoclusters
- The highest overall grade in class

Bachelor of Electrical Engineering , Faculty of Electrical Engineering, University of Sarajevo (overall grade: 9.82 of 10.00), 2006-2009

- Specialised in Automatic Control and Electronic Devices
- The single best student of the 2006-2009 cohort (~200 students)

TEACHING EXPERIENCE

Supervisions, Department of Electronic & Electrical Engineering, UCL

- 3 PhD students (1 as the first supervisor, 2 as the subsidiary supervisor)
- Supervision of undergraduate 3rd and 4th year projects & MSc students (20 in total)

Lab Demonstrator, Department of Electronic & Electrical Engineering, UCL

- MSc course "Experimental Techniques for Nanotechnology", 2010 - 2012
- Demonstrator for the 1st year BEng Engineering course "Numerical Methods". 2010-2013

Visiting Lecturer, Faculty of Electrical Engineering, University of Sarajevo

- Design and teaching the MSc course "Microelectronic Devices and Modelling", 2015
- Design and supervision of students projects (18 students; 6 projects in total)

Teaching Training

- Development pathway for postgraduate students (UCL Arena One)
- Introduction to research supervision course (UCL Doctoral School and UCL Arena Centre)

COMMERCIAL EXPERIENCE

- Co-founder of the company ("Intrinsic Semiconductor Technologies", www.intrinsicst.com)
- Chief Technology Officer at IntrinsicST
- 3 patents
- Securing Proof of Concept funding from UCLB (~£160k)

AWARDS & RECOGNITIONS

- Royal Academy of Engineering Research Fellowship (£500k), 2017-2021 (seven awards made from 130+ applicants)
- SET for BRITAIN 2016 - selected to display research poster at the House of Commons, 2016

- “One to Watch 2015” award from UCL Enterprise for UCL’s most innovative and entrepreneurial staff, 2015
- Shortlisted for the interview - RAEng ERA Foundation Entrepreneurs Award, 2014
- Top 3 PhD graduated students in 2013/14, EE Department, UCL
- UCL Overseas Research Scholarships (~£53k), 2010
- UCL Faculty of Engineering Scholarship (~£52k), 2010
- Oxford Instruments award for the best MSc project, 2010
- “Golden Award Badge” for the single best student of the 2006-2009 cohort (~200 students), University of Sarajevo, 2009

Media recognition:

- BBC online article - the most-read science story for a week (“Memristors in silicon promising for dense, fast memory”, by Jason Palmer, 18 May 2012)
- EETimes online article (“ReRAMs: 3D Filaments and Brain-like Functions”, by Ron Neale, 3 Feb 2016)
- EENews online article (“University College London spins out ReRAM startup”, by Peter Clarke)
- Intrinsic ST featured in Spinouts UK 2018;

MEMBERSHIP OF PROFESSIONAL SOCIETIES AND OTHER ACTIVITIES

- Member of Institute of Physics (IOP), 2014 - present
- Review Editor - Frontiers in Materials, 2015 - present
- IEEE Golden Reviewer (2013-2018)
- STEM UK Ambassadors 2019 - present
- Co-founder of an NGO "Association for Advancement of Science and Technology" in Bosnia (www.annt.ba) 2018;

PUBLICATIONS

Journal publications:

1. A. Mehonic, D. Jokšas, W.H. Ng, M. Buckwell, A. J. Kenyon “Simulation of Inference Accuracy Using Realistic RRAM Devices”, *Frontiers in Neuroscience* 13, 593 (2019).
2. E. Miranda, A. Mehonic, W.H. Ng, A.J. Kenyon “Simulation of Cycle-to-Cycle Instabilities in SiO_x-Based ReRAM Devices Using a Self-Correlated Process With Long-Term Variation” *IEEE Electron Device Letters*, 40(1), pp.28-31 (2019).
3. M. Lanza, et al. “Recommended methods to study resistive switching devices”, *Advanced Electronic Materials*, 1800143 (2018).
4. S. Chen et al. "On the Limits of Scalpel AFM for the 3D Electrical Characterization of Nanomaterials." *Advanced Functional Materials* 1802266 (2018).
5. A. Mehonic, A. L. Shluger, D. Gao, I. Valov, E. Miranda, D. Ielmini, A. Bricalli, E. Ambrosi, C. Li, J. J. Yang, Q. Xia, “Silicon Oxide (SiO_x): A Promising Material for Resistance Switching?” *Advanced Materials* 1801187, (2018).

6. A. J. Kenyon, W. H. Ng, M. S. Munde, M. Buckwell, D. Joksas, A. Mehonic "The interplay between structure and function in redox-based resistance switching." *Faraday Discussions*. in press, (2018).
7. W. H. Ng, A. Mehonic, M. Buckwell, L. Montesi, A. J. Kenyon. "High Performance Resistance Switching Memory Devices Using Spin-on Silicon Oxide." *IEEE Transactions on Nanotechnology* in press, (2018).
8. T. Sadi, A. Mehonic, L. Montesi, M. Buckwell, A. J. Kenyon, A. Asenov "Investigation of Resistance Switching in SiO_x RRAM Cells Using a 3D Multi-Scale Kinetic Monte Carlo Simulator." *Journal of Physics: Condensed Matter* 30. 8 (2018).
9. K. Zarudnyi, A. Mehonic, L. Montesi, M. Buckwell, S. Hudziak, and A. J. Kenyon "Spike-Timing Dependent Plasticity in Unipolar Silicon Oxide RRAM Devices." *Frontiers in Neuroscience* 12, 57 (2018).
10. A. Mehonic, T. Gerard, A. J. Kenyon. "Light-activated resistance switching in SiO_x RRAM devices." *Applied Physics Letters* 111.23, 233502, (2017).
11. M.S. Munde, A. Mehonic , W.H Ng , M. Buckwell , L. Montesi , M. Bosman, A.L. Shluger , A. J. Kenyon "Intrinsic Resistance Switching in Amorphous Silicon Suboxides: The Role of Columnar Microstructure.", *Scientific reports* 7.1 9274, (2017).
12. Y. Yang, Y. Takahashi, A. Tsurumaki-Fukuchi, M. Arita, M. Moors, M. Buckwell, A. Mehonic, A.J. Kenyon. "Probing electrochemistry at the nanoscale: in situ TEM and STM characterizations of conducting filaments in memristive devices." *Journal of Electroceramics*. 11:1-21, (2017).
13. A. Mehonic, M.S. Munde, W.H. Ng, M. Buckwell, L. Montesi, M. Bosman, A.L. Shluger, A.J. Kenyon. "Intrinsic resistance switching in amorphous silicon oxide for high performance SiO_x ReRAM devices." *Microelectronic Engineering*. 178:98-103, (2017).
14. L. Montesi, M. Buckwell, K. Zarudnyi, L. Garnett, S. Hudziak, A. Mehonic, A.J. Kenyon. "Nanosecond Analog Programming of Substoichiometric Silicon Oxide Resistive RAM." *IEEE Transactions on Nanotechnology* 15, no. 3: 428-434 (2016).
15. A. Mehonic, M. Buckwell, L. Montesi, M. Munde, D. Gao, S. Hudziak, R.J. Chater, S. Fearn, D. McPhail, M. Bosman, A.L. Shluger. "Nanoscale Transformations in Metastable, Amorphous, Silicon-Rich Silica." *Advanced Materials* 28(34), 7486-7493, (2016) (featured on the back cover)
16. A. Mehonic and A. J Kenyon "Emulating the electrical activity of the neuron using a silicon oxide RRAM cell." *Frontiers in Neuroscience* 10:57, (2016)
17. M. Duchamp, V. Migunov , A. H. Tavabi , A. Mehonic , M. Buckwell , M. Munde , A. J. Kenyon , R. Dunin-Borkowski. "In situ transmission electron microscopy of resistive switching in thin silicon oxide layers", *Resolution and Discovery* 1.1: 27-33, (2016).
18. D. Carta, P. Guttman, A. Regoutz, A. Khiat, A. Serb, I. Gupta, A. Mehonic, M. Buckwell, S. Hudziak, A.J. Kenyon, T. Prodromakis. "X-ray spectromicroscopy investigation of soft and hard breakdown in RRAM devices.", *Nanotechnology* 27, no. 34 345705, (2016).
19. M. Buckwell, L. Montesi, A. Mehonic, O. Reza, L. Garnett, M. Munde, S. Hudziak, and A. J. Kenyon. "Microscopic and spectroscopic analysis of the nature of conductivity changes during resistive switching in silicon-rich silicon oxide." *Physica status solidi (c)* 12, 1-2, 211- 217, (2015).
20. M. Buckwell, L. Montesi, S. Hudziak, A. Mehonic, and Anthony J. Kenyon. "Conductance tomography of conductive filaments in intrinsic silicon-rich silica RRAM." *Nanoscale* 7, no. 43: 18030-18035, (2015).
21. A. Mehonic, M. Buckwell, L. Montesi, L. Garnett, S. Hudziak, S. Fearn, R. Chater, D. McPhail, and A. J. Kenyon. "Structural changes and conductance thresholds in metal-free intrinsic SiO_x resistive random access memory." *Journal of Applied Physics* 117, no. 12 : 124505, (2015).

22. E. Miranda, A. Mehonic, J. Blasco, J. Suñé, and A. J. Kenyon. "Multiple Diode-Like Conduction in Resistive Switching SiO_x-Based MIM Devices." *Nanotechnology, IEEE Transactions on* 14, no. 1: 15-17, (2013).
23. E. Miranda, A. Mehonic, J. Suñé, and A. J. Kenyon. "Multi-channel conduction in redox-based resistive switch modelled using quantum point contact theory." *Applied Physics Letters* 103, no. 22: 222904, (2013).
24. A. Mehonic, A. Vrajitoarea, S. Cueff, S. Hudziak, H. Howe, C Labbe, R. Rizk, M. Pepper, and A. J. Kenyon. "Quantum conductance in silicon oxide resistive memory devices." *Scientific reports* 3 (2013).
25. A. Mehonic, S. Cueff, M. Wojdak, S. Hudziak, C. Labbé, R. Rizk, and A. J. Kenyon. "Electrically tailored resistance switching in silicon oxide." *Nanotechnology* 23, no. 45 : 455201, (2012).
26. A. Mehonic, S. Cueff, M. Wojdak, S. Hudziak, O. Jambois, C. Labbé, B. Garrido, R. Rizk, and A.J. Kenyon. "Resistive switching in silicon suboxide films." *Journal of Applied Physics* 111, no. 7, 074507, (2012) (journal's most-read publication in June/July 2012).
27. A. Mehonic, S. Cueff, M. Wojdak, S. Hudziak, O. Jambois, C. Labbé, B. Garrido, R. Rizk, and A.J. Kenyon. "Intrinsic Resistive Switching in Bulk SiO_x Films." *MRS Proceedings*. 1430. Cambridge University Press, (2012).

Books (book chapters):

1. A. Mehonic, A. J. Kenyon. "Resistive Switching in Oxides." In Defects at Oxide Surfaces, pp. 401-428. *Springer International Publishing*, (2015).

Patents:

1. A.J. Kenyon, and A. Mehonic "Oxide memory resistor including semiconductor nanoparticles." U.S. Patent Application No. 14/130,604.
 2. A.J. Kenyon, and A. Mehonic "A switching resistor and method of making such a device", No. 1705210.1
 3. A.J. Kenyon, and A. Mehonic "A light-activated switching resistor, an optical sensor incorporating a light-activated switching resistor, and methods of using such devices.", No. p111931gb
- Over 50 International Conference presentations and proceedings (including 5 invited talks) - *Material Research Society (MRS) & European Material Research Society (EMRS) meetings, COST meetings, IEEE conferences*, 2010 - 2018

Full list of publications on <https://iris.ucl.ac.uk/iris/browse/profile?upi=AMEHO63>