



Professor Mike Ashfold

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Leverhulme Chair

Area of research

Advancing photochemistry, diamond chemical vapour deposition and oxide nanorod growth

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Summary

Detailed studies of the UV photochemistry and photophysics of gas phase molecules using a variety of state-of-the-art laser based techniques including *H atom photofragment translational spectroscopy* and *velocity map ion imaging*, and complementary electronic structure calculations. Current activities include extension of these methods to allow study of larger, less volatile (bio)molecules in the gas phase, the application of multimass imaging methods, and using ultrafast time-resolved pump-probe methods to explore the UV photochemistry and photophysics of such molecules in solution.

Growth and characterisation of diamond thin films grown by chemical vapour deposition (CVD). Current interest centres on exploring the gas phase and gas-surface chemistry that underpins CVD of diamond (and doped diamond) in microwave reactors using a range of laser and optical emission spectroscopy methods, plasma modelling, and QM/MM modelling of the gas-surface reactions.

Pulsed laser ablation and deposition as a route to forming nanostructured thin films, focussing particular on detailed investigations of the laser-target and laser-plume interactions through careful analysis of temporally, spatially and wavelength resolved images of optical emission from the ablation plume.

Professor Ashfold is a supervisor in the EPSRC Centre for Doctoral Training in Diamond Science and Technology.

Biography

Professor of Physical Chemistry, School of Chemistry, University of Bristol, 8/92 – present.

(Head of Physical and Theoretical Chemistry Section, 10/95-9/97; 8/02-7/11).

Previous appointments:

Reader in Chemical Physics, School of Chemistry, University of Bristol, 8/90 - 7/92.

Lecturer in Chemical Physics, School of Chemistry, University of Bristol, 8/84 - 7/90.

Research Associate in Chemical Physics, School of Chemistry, University of Bristol, 10/81 - 7/84.

Guy Newton Junior Research Fellow, Jesus College, Oxford,

Academic qualifications:

Ph.D. University of Birmingham (Department of Chemistry), 1978.

B.Sc. (Hons) University of Birmingham, 1975.

Honours, awards, prizes

Marlow Medal and Prize of the Faraday Division of the Royal Society of Chemistry, 1987.

Visiting Fellowship, Joint Institute for Laboratory Astrophysics, University of Colorado, U.S.A., 1990.

Corday-Morgan Medal and Prize of the Royal Society of Chemistry, 1989.

Royal Society Leverhulme Trust Senior Research Fellow, 1994/5.

Tilden Medal and Prize of the Royal Society of Chemistry, 1996.

EPSRC Senior Research Fellowship, 1997-2002.

Royal Society of Chemistry **Industrially-sponsored Award in Spectroscopy**, 2000.

Daiwa Adrian Prize, 2004 (with Prof. M. Kawasaki, Kyoto)

Royal Society of Chemistry **Industrially-sponsored Award in Chemical Dynamics**, 2006.

Fellow of the Royal Society, 2009.

President, Faraday Division of Royal Society of Chemistry, 2009-12.

Royal Society Leverhulme Trust Senior Research Fellow, 2011/2.

Liversidge Award of the Royal Society of Chemistry, 2014.

Herbert P. Broida Prize of the American Physical Society, 2015

Keywords

- gas and condensed phase photochemistry and photophysics
- laser spectroscopies
- plasma diagnosis
- diamond chemical vapour deposition
- pulsed laser ablation

Memberships

Organisations

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Recent publications

- Bain, M, Hansen, CS, Karsili, TNV & Ashfold, M, 2019, '[Quantifying rival bond fission probabilities following photoexcitation: C-S bond fission in t-butylmethylsulfide](#)'. *Chemical Science*.
- Mahoney, EJD, Mushtaq, S, Ashfold, M & Mankelevich, YA, 2019, '[Combined spatially resolved optical emission imaging and modeling studies of microwave-activated H₂/Ar and H₂/Kr plasmas operating at powers and pressures relevant for diamond chemical vapor deposition](#)'. *Journal of Physical Chemistry A*, vol 123., pp. 2544-2558
- Marchetti, B, Karsili, TNV & Ashfold, M, 2019, '[Exploring Norrish type I and type II reactions: an ab initio mechanistic study highlighting singlet-state mediated chemistry](#)'. *Physical Chemistry Chemical Physics*.
- Jiang, T, Du, B, Zhang, H, Yu, D, Sun, L, Zhao, G, Yang, C, Sun, Y, Yu, M & Ashfold, MN, 2019, '[High-performance photoluminescence-based oxygen sensing with Pr-modified ZnO nanofibers](#)'. *Applied Surface Science*.
- Chang, Y, Yu, Y, Wang, H, Hu, X, Li, Q, Yang, J, Su, S, He, Z, Chen, Z, Che, L, Wang, X, Zhang, W, Wu, G, Xie, D, Ashfold, MNR, Yuan, K & Yang, X, 2019, '[Hydroxyl super rotors from vacuum ultraviolet photodissociation of water](#)'. *Nature Communications*, vol 10.
- Liu, H, Ashfold, MNR, Meehan, DN & Wagenaars, E, 2019, '[Wavelength-dependent variations of the electron characteristics in laser-induced plasmas: A combined hydrodynamic and adiabatic expansion modelling and time-gated, optical emission imaging study](#)'. *Journal of Applied Physics*, vol 125.
- Ashfold, MNR, Ingle, RA, Karsili, TNV & Zhang, JS, 2019, '[Photoinduced C–H bond fission in prototypical organic molecules and radicals](#)'. *Physical Chemistry Chemical Physics*.
- Ashfold, MN, Yuan, K & Yang, X, 2018, '[Perspective: The development and applications of H Rydberg atom translational spectroscopy methods](#)'. *Journal of Chemical Physics*, vol 149.
- Karsili, TNV, Marchetti, B & Ashfold, M, 2018, '[The Role of \$1\pi^*\$ States in the Formation of Adenine Radical-Cations in DNA Duplexes](#)'. *Chemical Physics*, vol 515., pp. 464-471
- Liu, X, Sun, Y, Yu, M, Yin, Y, Du, B, Tang, W, Jiang, T, Yang, B, Cao, W & Ashfold, MN, 2018, '[Enhanced ethanol sensing properties of ultrathin ZnO nanosheets decorated with CuO nanoparticles](#)'. *Sensors and Actuators, B: Chemical*, vol 255., pp. 3384-3390
- Bain, M, Hansen, CS & Ashfold, MN, 2018, '[Multi-mass velocity map imaging study of the ultraviolet photodissociation of dimethyl sulfide using single photon ionization and a PlmMS2 sensor](#)'. *Journal of Chemical Physics*, vol 149.
- Cooper, GA, Hansen, CS, Karsili, TNV & Ashfold, M, 2018, '[Photofragment Translational Spectroscopy Studies of H Atom Loss Following Ultraviolet Photoexcitation of Methimazole in the Gas Phase](#)'. *Journal of Physical Chemistry A*, vol 122., pp. 9869-9878

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