Electron and Positron Induced Chemistry
(EPIC)

EU Network contract no. HPRN-CT-2002-00179

Commencement September 2002 (Funds received December 2002)
Duration 39 months
Period covered by this report: September 2002 to September 2005

Network coordinator:
Professor N J Mason
Dept of Physics and Astronomy
The Open University
Walton Hall
Milton Keynes
MK7 6AA
UNITED KINGDOM

Telephone; 44 1908 655132
Telefax; 44 1908 654192
Email; n.j.mason@open.ac.uk

Network home page: http://www.isa.au.dk/epic

Part A: Research Results

A1 Scientific Highlights;

The EU Framework V Network Electron and Positron Induced Chemistry (EPIC) is a network of internationally renowned research teams in Europe dedicated to the study of electron and position interactions with molecules. Its research is broadly divided into two sub-topics based upon the type of molecular targets involved.

1. Studies of interactions with halogenated targets are relevant to industrial plasmas, in particular those used in the semiconductor industry.

2. Studies of interactions with biological molecules and in particular the nucleotide based research that is linked to study of radiation damage in DNA.

Participating institutions are;
1.Centre of Molecular and Optical Sciences, The Open University, United Kingdom
2.Department of Physics and Astronomy, University College London, United Kingdom
3.Institut fur Ionenphysik, Leopold Franzens Universitaet Innsbruck, Austria
4.Department of Physical Chemistry, Freie Universitaet Berlin, Germany
5.Department of Chemistry, Universita di Roma 'La Sapienza', Universita di Roma 'La Sapienza', Italy
6. Department of Physics, University of Aarhus, Denmark
7. J Heyrovsky Institute of Physical Chemistry, Academy of Sciences of the Czech Republic, The Czech Republic.
8. Laboratoire des Collisions Atomiques et Moléculaires Université Paris-Sud, Paris, France

Together with collaborators within:
Department of Physics, Trento University, Italy
Department of Physics, University of Bonn, Germany
Department of Physics, Charles University, Prague, Czech Republic
Institute of Physics Belgrade, Serbia
Department of Physics, Comenius University, Slovakia
CSIC, Madrid, Spain
Dept of Physics, Nuovo University of Lisbon

The Network officially started in September 2002 although funds were only received in December 2002 accordingly permission was granted to extend the Network until December 31 2005 Most younger researchers staff were appointed in 2003 and 2004 ensuring that the volume and pace of research accelerated throughout 2004 and 2005 with nearly 300 Journal publications and over 400 conference abstracys etc being generated by members of the Network since the commencement of the Network. The Network has shown itself to be a dynamic, rapidly evolving an innovative and unique research programme that has gained international recognition amongst leading scientists in Europe, the USA and Japan.

During the course of the Network the scientific direction of the Network has shifted with increasing emphasis towards the study of biomolecules a topic which is now regarded as one of the ‘hot topics’ of modern molecular physics/chemical physics research and one within which the Network has emerged as the International leader. Several partners (UIBK,FUB,ULRS,OU) have produced pioneering results that provide significant consequences for the molecular description of genotoxic effects in living cells due to low-energy electrons, which are found to be the most abundant secondary species formed from ionizing radiation. Many papers have been published in

internationally leading journals (PRL, J Chem. Phys.) and Network members invited to present their results at several prestigious International meetings. Collaborations with the radiation chemistry community have developed and several new avenues of research opened allowing Network partners to foster new research ties with the clinical community. Indeed such is the rapid development of this research topic that a new EU Network to investigate interactions with biomolecules and its constituent molecules has been submitted under Framework VI Programme. This network has widened the participation to include ion and photon interactions with biomolecules.

The second highlight concerns the potential of slow electrons to act as a soft tool to control chemical reactions in the condensed phase. By setting the energy of a well defined electron beam to values below 3 eV it has been shown that it is possible to initiate chemistry at very low incident energies - energies less than that predicted to rupture chemical bonds. This low energy chemistry is driven by the process of dissociative electron attachment (DEA). DEA fragments may initiate further chemical reactions. For example in a CH_3Cl/NF_3 cluster F^- from NF_3 reacts with CH_3Cl by $F^- + CH_3Cl \rightarrow CH_3F + Cl^-$. An identical process may occur on a multilayer of co-deposited CH_3Cl and NF_3.Cl^- desorbs from the film leaving CH_3F so a multilayer may be chemically converted into pure film of another chemical species. Electron reactions can also bind *specific functional groups* to a surface in a controlled way. DEA of acetonitrile $CH_3CN + e^- \rightarrow CH_2CN^- + H$ being used in the functionalization of hydrogenated diamond to attach organic groups to surfaces.Such experiments suggest that it is possible to manipulate molecular reactions on surfaces using low energy electrons, such research has great significance in the nanotechonology area where 'nanoscale lithography' may be induced by electron patterning (perhaps using scanning tunnel microscopes) Such DEA induced processing has been entitled *DEA induced chemical lithography* and is the topic of a further Network application to Framework VI in which members of the EPIC RTN join with members of the nanotechnology community and in particular researchers using scanning tunnel microscopes to manipulate chemical reactions on surfaces.

A third highlight has been the development of industrial contacts with the Japanese semiconductor industry. The Network's research into electron interactions with halogenated targets relevant to industrial plasmas has received widespread interest amongst the industrial community particularly in Japan. This has led to the organization of an annual meeting entitled EU-Japan Symposium on Plasma Technology. The first was held under the auspices of EPIC in Stockholm in July 2003, the Second in Tokyo, Japan February 2003 and the third in Slovakia in January 2005. The Fourth will be held in Sendai in Japan in January 2005 and hosted by recently established Japanese Centres of Excellence in Plasma Technology. In 2004 the Japanese Centres founded an International Network of Centres of Excellence in Plasma Technology (COE Plasma) inviting centres from Korea, USA, Germany, France and the Netherlands to join, The EPIC Network was given a special place as a distributed 'Network of Excellence' and the second COE Forum will be held in Germany in 2006 with EPIC participation. The COEs were established with the intention of exchanging staff and students between such centres. It is expected that some of the Young Researchers employed by the Network will take advantage of these exchanges and travel to Japan to conduct further research, their training in the EPIC Network having made them highly suitable personnel for such a programme. These contacts led to the submission of a RTN proposal to Framework VI with a major participation from the Japanese industry to provide a truly international research training opportunity.

The success of the Network and the demand for other academic laboratories; institutes etc to participate in the research programmed evolving from the EPIC Network has led to EPIC members seeking further funding to build upon EPIC, These applications have met with success. An EU COST Action (Physics P9) on Radiation Damage (RADAM) was awarded and commenced in November 2003 to study radiation damage at the molecular level (www.isa.au.dk/cost). This five

year programme links the electron/positron community with those studying ion and photon damage of biological molecules and brings EPIC network members together with radiation chemists and medical researchers. A joint meeting between EPIC and RADAM was held in Lyons 24th to 27th June 2004 http://costp9-radam.in2p3.fr/index.html and brought together over 150 researchers . In March 2005 this was followed by an EPIC/COST Training Workshop held in Potsdam Berlin http://www.radam05.org/ and EPIC and COST RADAM both participated in the International Miller conference on Radiation chemistry held in Nice in September http://web.cnrs-orleans.fr/~webcbm/miller/index.htm and the micordosimetry conference held in Venice in November http://micros05.lnl.infn.it/. The COST RADAM has to date allowed over 100 short visits (1 to 4 weeks) to be organized between different groups/institutes and laboratories many of which have involved EPIC partners either as hosts or travelling fellows including several of the Younger Researchers supported by EPIC who have thus been able to visit and collaborate with teams not in the EPIC Network.

A major achievement of the EPIC Network has been to demonstrate the ability of electrons (and positrons) to induce chemistry both in the gas phase, in clusters and on surfaces. By combining our knowledge with that of the nanotechnology community we have established new opportunities for electron induced processing. Accordingly we applied for and were awarded an ESF Funded Programme entitled Electron Induced Processing at the Molecular level (EIPAM) http://www.isa.au.dk/eipam/. This five year programme brings EPIC members together with researchers in the Scanning Tunnel Microscopy (STM) community to study how nanoscale physics and chemistry may be developed using STM techniques. The Programme commenced in July 2004 and the first meeting was held as part of the 332th Wilhelm and Else Heraeus Seminar, "Processes Driven by Low Energy Electron-Molecule Interactions" 1st-4th September, 2004 at Bad Honnef, Germany. 2002. The Programme supports short visits, conferences and workshops and *Fellowships*. The first EIPAM Fellows were been appointed in October 2004 and included several from EPIC partners. In 2005 EIPAM and EPIC annual Meetings were combined into a single meeting held in Viterbo in Italy June 25 to 30 http://www.isa.au.dk/eipam/. EIPAM 3 will allow members of the EPIC Network to continue to meet and is to be held in Malta September 16 – 20 2006.

Another aspect of the research conduced under EPIC that was not initially foreseen was the relevance of such research to the cold atom community. Much of the research now developing with cold atoms and molecules involves the interaction of particles including electron-atom and electron-molecule collisions. Therefore members of the EPIC network were approached by members of the cold atom/molecule collision community to discuss areas of mutual interest. An ESF Network entitled 'Collisions in Atom Traps (CATS)' was applied for and granted and will bring members of the cold atom community and members of EPIC to investigate electron/positron interactions with cold atoms and cold molecules, while also exploring the new world of ultracold plasmas ! This three year programme commenced in October of 2003. In February 2004 a special ESF 'Exploratory Workshop' on ultracold chemistry was held in Mulhouse, France that will brought several younger EPIC members together with younger researchers in cold atom/molecules and in April a meeting on ultracold plasmas held in Gif Sur Yvette Near Paris. These meetings led to the application of an ESF Eurocore programme on the Properties of Cold Quantum Matter, which was approved *the only one in physical sciences to be so approved*.

Conclusions on Status of the EPIC Network; The EPIC Network has more than fulfilled the hopes of its participants in acting as a forum and focus for development of electron and positron research within the European Community. As the Network draws to a close we believe that it has played a key role in fostering a new dynamism and excitement in electron and positron research that has led a renaissance in electron and positron physics is developed with applications exploited from astrophysics to life sciences. The Network has been widely admired outside Europe and acted as a

catalyst for similar collaborative projects most notably in Australia, where a Centre of Excellence in electron and positron physics has been established by the Government involving all the major Australian research universities.

After the end of the network the research community it has engendered will continue to develop its activities not least due to the superb set of younger researchers we have been able to recruit and train, several of which have now received further funding and some permanent academic positions. For the latest news request you view the Network webpage and those of the partners (http://www.isa.au.dk/epic) This Network will be updated even after the official end of the Network to report on progress of the research groups and their members.

Difficulties encountered to date

No major difficulties have been encountered to date. The Network being judged a great success by its participants and by the wider academic research community.

Recruitment was slow for some groups with delays in obtaining the funding from the EC (received only in December 2002) leading to the loss of two young researchers who had in principle agreed to join the network but who took other posts in October 2002 where funds were *immediately* available. This led to a slower than expected start for positron based research at UCL (partner 2) and for partner 5 (ULRS, Rome). However all posts were filled by late 2003 although some staff only started their training in January 2004. This staggered appointment schedule has required some alteration in the order of training courses with the experimental programme being accelerated and theoretical slightly retarded reflecting the appointment of experimental researchers ahead of theoretical appointees. *These difficulties in appointing staff has however led to some groups not being able to match the training months in the period Sept 2002 to August 2005, therefore we requested (and obtained) a formal extension to December 2005 (the date on which funds for the Network were actually received) – this has allowed all partners to complete their training and ensure no younger researcher's appointment is curtailed.*

In October 2002 the Network co-coordinator left University College London to take up a new post as Professor of Physics and Director of Research at the Open University. Since the original application involved a joint experimental and theoretical training programme at UCL this requires some alteration in the training arrangements between UCL and OU with UCL continuing training in theoretical aspects of the programme and OU undertaking the experimental. For this reason Postdoc appointments were not made until July 2003 (for experiment) and January 2004 (for theory). The two institutes are only an hour travel time apart so the two teams are in weekly contact. Some rearrangement of funds between OU and UCL has been necessary to meet these arrangements with the funding for the younger researcher being transferred from the OU to UCL .

The largest 'difficulty' of the network to date has been its success ! Many other European groups as well as UC, Japanese, Australian, Brazilian and Indian groups have requested observer status to allow them to integrate with the research programme. We have been pleased to welcome them to our meetings (unpaid) and are delighted by the subsequent research that has evolved form these links. The success in obtaining support for two ESF Networks an ESF programme and most recently an ESF Eurocore has shown that the EPIC Network is achieving its stated goal of integrating European research in Electron and Positron Chemistry making Europe the international leader in this area. Our links with Japanese Industry is also a notable achievement and we hope that our applications for new RTNs under the Framework VI programme will meet with some success. We thank the EU for their support.

Younger Researchers Employed by the Network

The development of such a vibrant research community has proven to be ideal for the training of young research scientists. The major goal of EPIC is to train the next generation of researchers such that research in electron and positron research will continue to grow and develop in the next decade. The network has been fortunate to recruit a unique set of talented younger researchers whose work in the coming years will provide much of the momentum and creativity of the EU research programme. Training of these younger researchers has and will require a set of workshops, the first of which was held in the UK in September 2003 dedicated to training researchers in the study of biological systems and included practical courses in DNA extraction and analysis. A Vacuum training course was held in December 2003 and was repeated in December 2004. A theoretical methods workshop was held in Prague February 14 to 18 2005 This meeting was organized by the YRs themselves and provided them with a unique opportunity to discuss the future development of theoretical modeling of electron/positron interactions with molecules. The meeting specifically precluded more senior staff since they may have preconceptions as to which methodology to follow. Two younger researchers from India and Brazil also attend the meeting (funded by non EPIC Funds).

Presentation and communication skills have been developed by their attendance at Network meetings where younger researchers present their work to the Network members and other senior researchers. All younger researchers employed by July 2003 gave presentations at the EPIC network meeting in Prague in July 2003 and again at the Mid-term review meeting in June 2004 in Obergurgl Austria. At the combined EPIC EIPAM Meeting in Viterbo June 2005 all EPIC YRS then employed presented their research orally and in posters, the wider interests of the audience ensured a lively discussion ! The standard of the presentations was uniformly high.

The first of the EPIC Yrs to compete their training have all proceeded to new posts with Dr N Jones (UAR) being given a senior post at the Aarhus Storage Ring Facility commencing October 2004, testimony to the impact she has made during her time there as an EPIC Younger Researcher. Dr Dagmyr Jaksch (nee Mayr) has been employed as a lecturer at the Open University before starting maternity leave from December 20005. Dr Zoran Pesic employed in positron physics at UCL is now a research fellow at Institut des Nano Sciences de Paris, Campus Boucicaut, 75015 Paris, France. Ms Cristiana Arcidiacono at UCL is now preparing her PhD thesis for submission in 2006. Ms Sylwia Ptasinska (UIBK) submitted her thesis (within the three year period) and graduated in November 2004, employed as an EPIC postdoc in Innsbruick in 2005 in 2006 she will take up a post in University of Sherbrooke Canada. Michal Stano also employed at UIBK returns to Commenius University Slovakia to continue research as a research fellow. Dr Hasan Abdoul-Carime empolyed in FUB has returned to Paris. Mr Tibor Sadlako has retuened to Poland to continue his predoctoral studies. Dr. Jan Franz employed URLS Dec. 1st, 2004 to June 31, 2005 now has a three year postdoctoral post with another EPIC Network partner (UCL) to develop a positron scattering code to support EPIC led research. Dr. Slawomir Telega (ULRS Jan 2005 – November 2005) intends to continue his research in the group in Rome for another 9 months and his stay will be supported by another grant. He will carry out further studies on the threshold behaviour of electron and positron beams at low energies. Dr. Kai Willner (ULRS May 2005 – November 2005) intends to continue his research activities at the URLS Node and will be supported by another research grant. His interests will be on the asymptotic behaviour of phaseshifts in gaseous molecular systems. Dr. L. Gonzalez-Sanchez (ULRS May 2005 – Dec 2005) intends to continue her present research in the same group in Rome for another year and will be supported by another research grant. Her work will be focussing on the dynamical study of quantum collisional excitations of OH, OH^+ and OH^- molecular polar targets by collisions at ultralow energies, with the aim of establishing clear propensity rules that could be exploited by experimental studies of the same systems in magneto-optical traps. Within the Prague group Dr Vincent Brems will after concluding his EPIC research exploit his training skills by joining industry as a computational physicists and modeller. Michal Tarana will continue his research in the Prague. Dr Daniel Caceres.

After 12 and after 6 months as an EPI post-doc in the Paris research team (UPSO) has been appointed a lecturer at the University Carlos III in Madrid. Dr Damian Pliszka has a permanent teachings position in Poland, but hopes to continue to develop his EPIC based research through sabbatical and collaborations.

A2 Publications:

Those in italic are publications involving one or more network partners. (Brackets indicate partner numbers collaborating in the work with numbers as listed in A1). Underscore indicates younger member of the network. For further details please see the Network webpage and those of the partners (http://www.isa.au.dk/epic)

Partner 1; Open University

1 Electron and photon induced processes in SF_5CF_3
P Limão-Vieira, P A Kendall, S Eden, N J Mason, J Heinesch,
M-J Hubin-Franskin, J Delwiche and A Giuliani (2003) Radiation Physics and Chemistry 68 193-7 (1,6)

2 Low Energy Electron Attachment to CH_3CN
A Pelc, P Limao-Vieira, W Sailer, N J Mason, P Scheier, M Probst
and T D Mark Chem Phys Lett (2003) (1,3)

3 Theoretical total ionization cross sections of CH_x, CF_x SiH_x SiF_x (x =1 – 4) and CCl_4 targets by electron impact
K.N. Joshipura, M. Vinodkumar, B.K. Antony and N.J. Mason
Eur. Phys. J. D 23, 81-90 (2003)

4 Electron Driven Processes; Scientific challenges and technical opportunities
N J Mason (2003) Proceedings of 17th International Conference on the Application of Accelerators in Research and Industry 885-8

5 Study of condensed phase molecules and molecular synthesis in astrophysical environments.
A Dawes, P Holtom and N J Mason Recent Developments in Chemical Physics 4 (2003) 519-32

6 Dissociative electron attachment to formic acid (HCOOH)
A Pelc, W Sailer, P Scheier, M Probst, N J Mason, E Illenberger
and T D Maerk Chem. Phys Lett 361 277-84 (2002) (1,3,4)

7 Electron attachment to simple organic acids
A Pelc, W Sailer, P Scheier, N J Mason, E Illenberger and T D Maerk
Vacuum 20 (2003) 429-33 (1,3)

8 Temperature Dependent high-resolution infrared photoabsorption cross sections of trifluromethyl sulphur pentafluoride
P A Kendall, N J Mason, G A Buchanan, G Marston, P Tegeder, A Dawes, S Eden, P Limao Vieira and D A Newnham
Chemical Physics 287 137 – 142 (2003)

9 Low energy electron attachment to formic acid
A. Pelc, W. Sailer, P. Scheier, N.J. Mason and T.D. Märk
Eur. Phys. J. D 20, 441-444 (2002) (1,3)

10 Shrinking Ozone layer; Global Perspectives and Remedial Measures
S K Pathak and N J Mason Resonance Indian Journal of Science Education **7** 71-80 (2002)

11 Corona discharge in gaseous mixtures: Generation of ozone
J D Skalny, N J Mason and T Mikoviny
Romanian Reports in Physics 54 117- 133 (2002) (1,3)

12 2-methyl furan: An experimental study of the excited electronic levels by electron energy loss spectroscopy, VUV photoabsorption and photoelectron spectroscopy
A Giuliani, M J Hubin- Franskin, J Delwiche , P Limao Vieira and
N J Mason J. Chem. Phys. 119 (2003) 3670 (1,6)

13 Inelastic scattering and stopping power for electrons in O_2 and O_3 at intermediate and high energies, 0.3-5 keV
A. Williart, P. A. Kendall, F. Blanco, P. Tegeder, G. García, and N. J. Mason
Chem. Phys. Lett. (2003)

14 The Electronic states of 2-Furanmethanol (Furfuryl alcohol) studied by photon absorption and electron impact spectroscopy.
A. Giuliani , I. C. Walker ,J. Delwiche, S. V. Hoffmann, P. Limão-Vieira,
N. J. Mason, B. Heyne, M. Hoebeke and M. -J. Hubin-Franskin
J. Chem. Phys. 119 (2003) 7282. (1,6)

15 The Physics of a Thunderstorm B J Mason and N J Mason
Eur J Phys (2003) 24 S99

16 Electron collisions with the CF radical using the R-matrix method
I Rozum, N J Mason and J Tennyson J. Phys B 36 2419-32 (2003) (1,2)

17 Electron Scattering from Atoms, Molecules, Nuclei and Bulk Matter
C T Whelan and N J Mason Plenum Press published 2003

18 Electron and Photon impact excitation of CF_3I
S Eden, P Limao Vieira, N J Mason, M Katijma, M Okomoto, D Newnham and S Hoffmann in Electron Scattering from Atoms, Molecules, Nuclei and Bulk Mattered by C T Whelan and N J Mason Plenum Press 33 - 44 (2003)

19 Electron Energy Loss spectroscopy of Trifluromethyl Sulphur Pentaflouride
P A Kendall and N J Mason in Electron Scattering from Atoms, Molecules, Nuclei and Bulk Matter ed by C T Whelan and N J Mason
Plenum Press 99-110 (2003)

20 Electron Driven process: Scientific Challenges and Technological opportunities N J Mason in Electron Scattering from Atoms, Molecules, Nuclei and Bulk Matter Ed by C T Whelan and N J Mason
Plenum Press 179-190 (2003)

21 The electronic states of isoxazole studied by VUV absorption, electron energy loss spectroscopies and ab initio multi-reference configuration interaction calculations. I C Walker, M H Palmer, J Delwiche, S V Hoffman, P LVieira, N J Mason, M F Guest, M J Hubin-Franskin, J Heinsch and A Giuliani J. Chem. Phys. (2003) in press

22 Electron Scattering from Ozone. What do we know ? N J Mason
Physica Scripta (2003) 68 C37-43.

23 VUV photoabsorption of hexafluoropropene
S. Eden and P. Limão-Vieira, S.V. Hoffmann and N. J. Mason
Chem Phys Lett (2003) 379 170-176 (1,6)

24 Low energy (0-18eV) electron interaction with free and bound SF_5CF_3: Negative ion formation from single molecules, clusters and nanofilms
R Balog, M Stano, P. Limão-Vieira, C Konig, I Bald, N J Mason and E Ilenberger J. Chem Phys (2003) 119 10396 (1,4)

25 Electronic State spectroscopy of acetaldehyde, CH_3CHO by high resolution VUV photo-absorption
P Limao Vieira , S Eden, N J Mason and S V Hoffmann
Chem. Phys. Lett **376** 737-47 (2003) (1,6)

26 High resolution photo-absorption studies of acrylonitrile, C_2H_3CN and acetonitrile, CH_3CN Electronic State spectroscopy of acetaldehyde, CH_3CHO by high resolution VUV photo-absorption

S Eden, P Limao Vieira, P Kendall, N J Mason, S V Hoffmann and S M Spyrou
Eur. Phys. J D 26 201-210 (2003) (1,6)

27 Electron collisions with the CF_3 radical using the R-matrix method
I Rozum, N J Mason and J Tennyson New Journal of Physics (2003) **5** 155 (1,2)

28 Electronic Excitation of Tetrafluoroethylene, C_2F_4
S. Eden, P. Limão-Vieira[1], Paul Kendall, N. J. Mason, J. Delwiche, M.-J. Hubin-Franskin, M. Kitajima, H. Tanaka, H. Cho and S.V. Hoffmann (2003)
Chem Phys 297 257-269 (2003) (1,6)

29 Complex study of negative corona discharge in pure carbon dioxide and its mixtures with oxygen.
T Mikoviny, M Kocan, S Matejcik, N J Mason and J D Skalny
J Phys D (2004) 37 64-73 (1,3)

30 Ozone generation in a negative corona discharge fed with N_2O and O_2
J D Skalny, S Matejcik, T Mikoviny, S Eden and N J Mason
J Phys D; Applied Physics (2004) 37 1052-57 (1,3)

31 An experimental study of SF_5CF_3 by electron energy loss spectroscopy, VUV photo-absorption and photoelectron
P. Limão-Vieira, S. Eden, P. A. Kendall, N. J. Mason, A. Giuliani, J. Heinesch, M. -J. Hubin-Franskin, J. Delwiche and S. V. Hoffmann
Int J Mass Spec. (2004) 233 335-41 (1,3)

32 Electron impact ionization studies with aeronomic molecules
B K Anthony, N J Mason and K Joshipura
International J Mass Spec. (2004) 233 207-214

33 An analysis of mass spectrometric study of negative ions extracted from negative corona discharge in air.
Jan D. Skalny, Tomas Mikoviny, Stefan Matejcik, Nigel J. Mason
Int J Mass Spec. (2004) 233 317-24

34 R-matrix calculation of low-energy electron collisions with LiH
B K Antony, N J Mason and J Tennyson J Phys B (2004) 37 1689 - 1697.(1,2)

35 On the valence shell electronic spectroscopy of 2-vinyl furan
A Giuliani, I C Walker, J Delwiche, S V Hoffman, C Kech, P L Vieira,
N J Mason and M J Hubin-Franskin J. Chem Phys (2004) 120 10972-10982 (1,3)

36 Cross Sections for electron collisions with water molecules
Y Itikawa and N J Mason J Chem Phys Ref Data in press

37 Sensitization of 5-bromouridien by slow electrons
H Abdoul-Carime, P Limao-Vieira, S Gohlke, I Petrushko, N J Mason and E Illenberger
Chemical Physics Letters 393 442-7 (2004)(1,4)

38 Dissociative Electron Attachment to dinitrogen pentoxide N_2O_5
P Cicman, G A Buchanan, B Gulejova, J D Skalny, N J Mason, P Scheier
and T D Maerk
J. Chem Phys. 121 9891-9897 (2004) (`1,3)

39 The effect of ozone treatment on the microbial contamination of pork meat measured by detecting the emissions using PTR-MS and by enumeration of microorganisms
D. Mayr, T. Mikoviny, R. Margesin, F. Schinner, J.D. Skalny, T.DMärk and N. J. Mason
Int J Mass Spec. 239 209-14 (2004) (1,3)

40 Cross Sections for electron collisions with water molecules
Y Itikawa and N J Mason J. Phys. Chem. Ref. Data 34 1-22 (2005)

41 Electron scattering cross sections for SF6 and SF5CF3 at intermediate and high energies (100-10000 eV)
P. Limão-Vieira, F. Blanco, J. C. Oller, A. Muñoz, J. M. Pérez, M. Vinodkumar, G. García, and N. J. Mason
Phys Rev A71 032720 (2005)

42 A combined experimental and theoretical study on the formation of the aminoacid glycine (NH2CH2COOH) and its isomer (CH3NHCOOH) in extraterrestrial ices
P D Holtom, C J Bennett, Y Osamura, N J Mason and R I Kaiser
ASTROPHYSICAL JOURNAL 626 940-952 (2005)

43 Electron stimulated desorption of Cl^- from absorbed and condensed Cl_2; Effects of environment and orientation.
P Tegeder, R Balog, N J Mason and E Illenberger
Phys Chem Chem Phys **7** 685-690 (2005) (1,4)

44 Relaxation processes in a negative corona discharge fed by air, oxygen and carbon dioxide
J Orszagh, J D Skalny and N J Mason
Proceedings of WDS conference (2005)

45 Atmospheric Chemistry with Synchrotron Radiation
N J Mason, A Dawes, R Mukerji, E A Drage, E Vasekova, S M Webb, D Jaksch and P Limão-Vieira J Phys B (2005) **38** S893

46 FTIR spectroscopy and estimation of the global warming potential of CF_3Br and C_2F_4
E A Drage, E Vasekova, S M Webb, D Jaksch, R McPheat, K Smith and N J Mason
Journal of Quantitative Spectroscopy and Radiative Transfer (2005) in press

47 Rotational excitation of molecules by low energy electrons
Yukikazu Itikawa and Nigel Mason Physics Reports 414 1- 41 (2005)

48 Water; VUV electronic state spectroscopy by synchrotron radiation P. Limao-Vieira, Raquel Mota, Rui Parafita, Alexandre Giuliani, Joao Lourenco, Gustavo Garcia, Soeren Hoffmann, Nigel Mason, Paulo Ribeiro, PhD; Maria Raposo
Chem Phys Letter 416 (2005) 152-9 (1,6)

49 High-resolution, temperature dependant, fourier transform infrared spectroscopy of CF3I
SM Webb , D Jaksch, RA McPheat, E Drage , E Vasekova, P Limao-Vieira , N J Mason and K M Smith
Journal of Quantitative Spectroscopy& Radiative Transfer 94 425-438 (2005)

50 Total and ionization cross sections of electron scattering by fluorocarbons
B K Antony, K N Joshipura and N J Mason
J. Phys. B. 38 189-205 (2005)

51 Electronic State spectroscopy of c-C_4F_8 and c- C_5F_8 studied by high resolution VUV photo-absorption
E Vasekova, N J Mason, P Limao-Vieira and S V Hoffmann
Chem Phys Letters (submitted)

52 Electron interaction cross sections for CF_3I, C_2F_4 and CF_X (x=l-3)radicals
I. Rozum, P. Limão-Vieira, S. Eden, N. J. Mason and J. Tennyson
J Chem Phys Re f Data

53 VUV photo-absorption in CF_3X (X = Cl,Br,I) fluoro-alkanes
S Eden, P Limao-Viera, S V Hoffmann and N J Mason
Chem Phys (2005) in press (1,6)

54 VUV Photoabsorption Spectroscopy of Sulphur Dioxide Ice
P Holtom, A Dawes, R Mukerji and M Davis
Phys Chem Chem Phys (2005) in press

55 Acetic Acid electronic state spectroscopy by high resolution vacuum ultraviolet photo-absorption, electron impact, He(I) photoelectron spectroscopy and ab initio calculations
P Limao-Vieira, A Giuliani, M J Hubin-Franskin, J Delwiche, R Parafita, R Mota, D Duflot, J P Flament, E Drage, P Cahillane, N J Mason and S V Hoffmann
Chem Phys (2005) in press

56 Formation of carbon monoxide and carbon dioxide during 2- 4eV carbon ion irradiation of water ice

A Dawes, M P Davis, P D Holtom, N J Mason, R W McCullough, I D Williams, R Trassl and R I Kaiser Submitted to AJP (2005)

57 A morphological study of ammonia ice under astrochemical conditions using VUV Spectroscopy.
A Dawes, R J Mukerji, M P Davis, P Holtom, S M Webb, S V Hoffmann, D A Shaw and N J Mason AJP (2005) to be submitted (1,6)

Partner 2; University College London

1. I Rozum, NJ Mason and J Tennyson.
   Electron collisions with the CF2 radical using the R-matrix method
   J. Phys. B: At. Mol. Opt. Phys., 35, 1583-1591 (2002).(1,2)
2. JD Gorfinkiel, LA Morgan and J Tennyson.
   Electron impact dissociative excitation of water within the adiabatic nuclei approximation
   J. Phys. B: At. Mol. Opt. Phys., 35, 543-555 (2002)
3. JD Gorfinkiel, LA Morgan and J Tennyson.
   Electron impact dissociative excitation of water within the adiabatic nuclei approximation
   J. Phys. B: At. Mol. Opt. Phys., 35, 543-555 (2002)
4. A Faure and J Tennyson.
   R-matrix calculations for polyatomic molecular ions: electron scattering by H3+ and H3O+
   J. Phys. B: At. Mol. Opt. Phys., 35, 1865-1873 (2002).
5. CS Trevisan and J Tennyson.
   Calculated rates for the electron impact dissociation of molecular hydrogen, deuterium and tritium
   Plasma Phys. Controlled Fusion, 44, 1263-1276 (2002).
6. A Faure and J Tennyson.
   Electron-impact rotational excitation of symmetric top molecular ions
   J. Phys. B: At. Mol. Opt. Phys., 35, 3945-3956 (2002).
7. CS Trevisan and J Tennyson.
   Calculated rates for the electron impact dissociation of molecular hydrogen: mixed isotopomers and scaling laws
   Plasma Phys. Controlled Fusion, 44, 2217-2230 (2002).
8. A Faure and J Tennyson.
   Rate coefficients for electron-impact rotational excitation of H3+ and H3O+
   Mon. Not. Roy. astr. Soc., 340, 468-472 (2003).
9. I Rozum, NJ Mason and J Tennyson.
   Electron collisions with CF radicals using the R-matrix method
   J. Phys. B: At. Mol. Opt. Phys., (in press) (1,2)
10. J Tennyson, JD Gorfinkiel, I Rozum, CS Trevisan and N Vinci.
    Electron molecule collisions calculations using the R-matrix method
    Radiation Phys. Chem., (in press).
11. A Faure, J Gorfinkiel and J Tennyson.
    Electron-impact rotational excitation rates for the water molecule
    Mon. Not. Roy. astr. Soc., (submitted).
12. A. Faure, J.D. Gorfinkiel and J. Tennyson,\
    Low-energy electron collisions with water: elastic and rotationally inelastic scattering
    J. Phys. B: At. Mol. Opt. Phys 37}, 801-807 (2004
13. A. Faure and J. Tennyson Electron collision in harsh environments
    SF2A 2003 F. Coombes, D. Barret and T. Contini (Eds.),
    EDP Sciences (2004)

14. I. Rozum and J. Tennyson Elastic differential cross sections for the CFx (x=1,2,3) radicals
    J. Phys. B: At. Mol. Opt. Phys **37** 957-966 (2004)
15. J. Tennyson
    Partitioned R-matrix theory for molecules
    J. Phys. B: At. Mol. Opt. Phys **37** 1061-1071 (2004)
16. B.K. Antony, K.N. Joshipura, N.J. Mason and J. Tennyson
    R-matrix calculation of low-energy electron collisions with LiH,* %
    J. Phys. B: At. Mol. Opt. Phys.} **37** 1689-1697 (2004) (1,2)
17. N. Vinci and J. Tennyson
    Continuum states of CO
    J. Phys. B: At. Mol. Opt. Phys **37** 2011-2031 (2004)
18. J.D. Gorfinkiel and J. Tennyson
    Electron-H_3^+ collisions at intermediate energies,
    J. Phys. B: At. Mol. Opt. Phys **37** L343-L350 (2004)
19. N. Vinci, N. de Ruette, F.O. Waffeu-Tamo, O. Motapon, M.Fifirig, O. Crumeyrolle, X. Urbain, J. Tennyson and I. F. Schneider
    Towards a model for the dissociative recombination of the CO_2^+dication: states and couplings
    J. Phys.: Conference Series 4 162-167 (2005)
20. P.G. Burke and J. Tennyson
    R-matrix theory of electron molecule scattering
    Mol. Phys.}103 2537-2548 (2005)
21. J.D. Gorfinkiel and J. Tennyson
    Electron impact ionisation of small molecules at intermediate energies ;the molecular R-matrix with pseudostates method
    J. Phys. B: At. Mol. Opt. Phys, 38 1607-1622 (2005)
22. J.D. Gorfinkiel, A. Faure, S. Taioli, C. Piccarretta, G. Halmova and J. Tennyson,* %
    Electron--molecules collisions at low and intermediate energies using the R-matrix method
    Euro. J. Phys. D **35** 231-237 (2005)
23. O. Motapon, M. Fifirig, A. Florescu, F.O. Waffeu-Tamo, O.Crumeyrolle G. Varin-Breant, A. Bultel, P Vervisch, J. Tennyson and I.F.Schneider
    Reactive collisions between electrons and NO^+ ions: rate coefficient computations and relevance for the air plasma kinetics,* %
    Plasma Phys. Science Technology 15 23-32 (2006)
24. I. Rozum, P. Limao-Viera, S. Eden, N.J. Mason and J.Tennyson
    Electron interaction cross sections for CF_3 I, C_2F_4 CFx (x=1-3) radicals
    J. Phys. Chem. Ref. Data} (in press) (1,2)
25. S. Taioli and J. Tennyson
    WATERWAVES: wave packet dynamics on a complex triatomic potential
    Computer Phys. Comms, (submitted)
26. G. Halmova, J.D. Gorfinkel and J. Tennyson
    Low-energy electron collisions with the C_2 molecule using the R-matrix method,* %
    J. Phys. B: At. Mol. Opt. Phys (submitted)
27. K. Chakrabarti and J. Tennyson
    R-matrix calculation of the potential energy curves for Rydberg states of Carbon Monoxide,
    J. Phys. B: At. Mol. Opt. Phys (submitted)
28. S. Taioli and J. Tennyson
    Time-dependent wave packet dynamics leading to dissociative attachment
    J. Phys. B: At. Mol. Opt. Phys (submitted)

29. M. Tashiro, K. Morokuma and J. Tennyson, R-matrix calculation of electron collisions with electronically excited O_2 molecules
Phys. Rev. A (submitted)

Positron research

30. Laricchia, S Armitage, DE Leslie and P Van Reeth.
Positron and positronium interactions with atoms and molecules
Radiation Physics and Chemistry (2003) in press
31. DE Leslie, S Armitage and G Laricchia.
Positronium Beam Production and Scattering
contributed paper, Positron03 Workshop, Denmark
32. C Arcidiacono, A Kover and G Laricchia.
Electron ejection from collisions of positrons with helium
contributed paper, Positron03 Workshop, Denmark
33. M Szluinska and G Laricchia
Ionization processes induced by positrons
contributed paper, Positron03 Workshop, Denmark
34. M Szluinska, P Van Reeth and G Laricchia.
Empirical scaling of positron- and electron- impact ionization cross-sections
contributed paper, Positron03 Workshop, Denmark
35. G Laricchia, S Armitage and DE Leslie
Positronium induced collisions
invited paper, Positron03 Workshop, Denmark
36. A Kover, C Arcidiacono and G Laricchia.
Experiment on positron-atom scattering
invited paper, Positron03 Workshop, Denmark
37. DE Leslie, S Armitage and G Laricchia.
Production of collimated positronium from molecular nitrogen
J Phys B 35 (2002) 4819-4827
38. S Armitage, DE Leslie, AJ Garner and G Laricchia.
Fragmentation of positronium in collision with He atoms
Physical Review Letters 89 (2002) 173402-1
39. M Szluinska, P Van Reeth and G Laricchia.
Empirical scaling of positron- and electron-impact ionization cross sections
J Phys B 35 (2002) 4059
40. G Laricchia, P Van Reeth, M Szluinska and J Moxom.
Total positron-impact ionization and positronium formation from the noble gases
J Phys B 35 (2002) 2525
41. G Laricchia.
Scattering of positrons and positronium by atoms and molecules in
The Physics of Electronic and Atomic Collisions
(Rinton Press, New York) (2002) 329
42. S Armitage and G Laricchia.
Positronium scattering from atoms and molecules
Nucl. Instr. Meth. B 192 (2002) 67
43. P Van Reeth, M Szluinska and G Laricchia.
On the normalization of the positron-impact direct ionization cross-section in the noble gases
Nucl. Instr. Meth. B 192 (2002) 220

44. A Kövér, K Paludan and G Laricchia.
Electron ejection by positron impact ionization
Nucl. Instr. Meth. B 192 (2002) 167
45. M Szluinska, P Van Reeth and G Laricchia.
Energy dependence of the total ionization and positronium formation cross-sections in e+ - Xe collisions
Nucl. Instr. Meth. B 192 (2002) 215
46. JW Humberston, P Van Reeth and G Laricchia.
Correlations between cross sections and threshold energies for positronium formation and direct ionization
Nucl. Instr. Meth. B 192 (2002) 44
47. M. Szluinska and G. Laricchia Investigation into the energy dependence of the annihilation cross-section for Ne and Xe below the positronium formation threshold Nucl. Instr. Meth. B221 (2004) 100-106
48. G. Laricchia, S. Armitage and D. E. Leslie Positronium induced collisions Nucl. Instr. Meth. B221 (2004) 60-68
49. M. Szłuińska and G. Laricchia Positronium formation from Ar and Xe Nucl. Instr. Meth. B221 (2004) 107-111
50. Á. Kövér, C. Arcidiacono and G. Laricchia Differential ionization experiments on positron – atom scattering Nucl. Instr. Meth. B221 (2004) 56-59
51. Z. D. Pešić, C. Arcidiacono, R. Hellhammer, N. Stolterfoht and G. Laricchia Ionisation and fragmentation of H_2O molecule in the interaction with positrons and ions to be published in AIP conference series (2004)
52. Differential ionization experiments on positron-atom scattering
M. Szluinska and G. Laricchia Nucl. Instr. Meth. B 221 (2004) 107
53. Positronium Formation from CO_2 and H_2O, D. J. Murtagh , C. Arcidiacono, Z. D. Pešić and G. Laricchia Nucl. Instr. Meth. B (2005) submitted
54. Collisions Involving Positronium S. Armitage, D. E. Leslie, J. Beale and G. Laricchia Nucl. Instr. Meth. B (2005) submitted
55. Positron-impact ionization and positronium formation from helium
D.J. Murtagh, M. Szluinska, J. Moxom, P. Van Reeth and G. Laricchia J Phys B 28 (2005) in press
56. Production and scattering of a positronium beam
S. Armitage, J. Beale, D. Leslie and G. Laricchia Nucl. Instr. Meth. B 233 (2005) 88
57. On the energy dependence of the annihilation cross-sections for positrons in collisions with atoms and molecules
P. Van Reeth, G. Laricchia and J. W. Humberston Physica Scripta 71 (2005) C9
58. Low energy positron induced ionization in He and Ne
M. Szluinska, D. Murtagh and G. Laricchia Nucl. Instr. Meth. B 229 (2005) 51

3. UIBK: Institut fuer Ionen Physik, University of Innsbruck

1. L Feketeova, DJ Skalny, G Hanel, B Gstir, M Francis, TD Märk.
Production of Cl via dissociative electron attachment to Cl2
Int. Mass Spectrom., 223/224 (2003) 661-668.
2. A Pelc, W Sailer, P Scheier, NJ Mason, E Illenberger, TD Märk.
Electron attachment to simple organic acids
Vacuum, 70 (2003) 429-433.(3,1)
3. B Gstir, S Denifl, G Hanel, M Rümmele, T Fiegele, M Stano, L Feketeova, S Matejcik, K Becker, P Scheier and TD Märk.

High resolution multiple electron impact ionisation of He, Ne, Ar, Kr and Xe atoms close to threshold: appearance energies and Wannier exponents
Nucl. Instr. Methods, submitted (2002)

4. G Hanel, B Gstir, S Denifl, D Muigg, T Fiegele, M Rümmele, W Sailer, A Pelc, N Mason, E Illenberger, S Matejcik, F Hagelberg, K Becker, A Stamatovic, M Probst, P Scheier, TD Märk. (3,4)
   High resolution electron interaction studies with atoms, molecules, biomolecules and clusters
   Book (N. Mason, ed.) Cambridge Univ. Press, in print (2002)
5. S Matt, R Parajuli, O Echt, C Lifshitz, A Stamatovic, P Scheier and TD Märk.
   Kinetics and energetics of spontaneous and electron-induced fragmentation of molecular ions and cluster ions
   Book of Invited Papers of ICPEAC, in print (2002)
6. H Deutsch, K Becker, P Defrance, U Onthong, M Probst, S Matt, P Scheier and TD Märk.
   Calculated cross section for the electron impact ionisation of simple molecular ions
   Int. J. Mass Spectrometry, 223/224 (2003) 639-646.
7. JD Skalny, S Matejcik, T Mikoviny and TD Märk.
   Effect of temperature on dissociative electron attachment to CCl2F2
   Int.J.Mass Spectrom., 223/224 (2003) 217-228
8. P Cicman, M Francis, JD Skalny, TD Märk.
   The Ion Extraction Efficiency in a Crossed Beams Experiment using a Trochoidal Electron Monochromator
   Int. Mass Spectrom., 223/224 (2003) 271-278
9. P Cicman, A Pelc, W Sailer, S Matejcik, TD Märk.
   Dissociative, electron attachment to CHF2Cl
   Chem.Phys.Lett., 371 (2003) 231-237
10. S Matt-Leubner, A Stamatovic, R Parajuli, A Stamatovic, M Probst, P Scheier, TD Märk, O Echt , C Lifshitz.
    Time resolved kinetic energy release in propane
    Int.J.Mass Spectr., 222 (2003) 213-219
11. K Gluch, J Fedor, S Matt-Leubner, O Echt, A Stamatovic, M Probst, P Scheier and TD Märk.
    Kinetic energy release in Coulomb explosion of metastable C3H52+
    J.Chem.Phys., in print (2002)
12. M Stano, S Matejcik, JD Skalny and TD Märk.
    Electron impact ionisation of CH4 : ionisation energies and temperature effect
    J.Phys.B, submitted (2002)
13. H Drexel, W Sailer, V Grill, P Scheier, E Illenberger and TD Märk.
    Electron attachment to C2Cl4 and Trojan horse ionisation
    J.Chem.Phys., submitted 2002 (3,4)
14. K Gluch, P Scheier, W Schustereder, T Tepnual, L Feketeova, C Mair, S Matt-Leubner, TD Märk.
    Cross sections and ion kinetic energies for electron impact ionization of CH4
    Int.J.Mass Spectr., submitted, 2003
15. S Denifl, S Matejcik, B Gstir, G Hanel, M Probst, P Scheier and TD Märk.
    Electron attachment to 5-chloro uracil
    J.Chem.Phys., 118 (2003) 4107-4114
16. G Hanel, B Gstir, S Denifl, P Scheier, M Probst, B Farizon, M Farizon, E Illenberger and TD Märk. Electron attachment to uracil: effective destruction at subexcitation energies
    Phys.Rev.Letters, 90 (2003)188104, 1-4 (3,4)
17. S Matejcik, I Ipolyi and E Illenberger.
    Temperature Dependence of Dissociative Electron Attachment to CH2ClBr: Competition

between Cl- and Br- Formation
Chem. Phys. Lett. (submitted February 2003).(3,4)
18. W Sailer, A Pelc , P Scheier, M Probst, J Limtrakul , E Illenberger and TD Märk.
Low energy electron attachment to acetic acid
Chem. Phys. Letters Chem. Phys. Letters 378 (2003) 250-256. (3,4)
19. Low energy electron interaction with free and bound SF_5CF_3: negative ion formation from single molecules, clusters and nanofilms Richard Balog, Michal Stano, Paulo Limao-Vieira, Constanze Koenig, Ilko Bald, Nigel. J. Mason, Eugen Illenberger J. Chem. Phys. 119 (2003) 10396-10403.(3,1)
20. S. Denifl, S.Ptasinska, M. Cingel, S. Matejcik, P. Scheier, T.D. Märk - Electron attachment to the DNA bases thymine and cytosine. Chem. Phys. Letters 377 (1-2) 2003, 74-80
21. S.Ptasinska, S. Denifl, A. Abedi, P. Scheier, T.D. Märk - Dissociative electron attachment to gas-phase glycine. Analytical and Bioanlytical Chemistry 377 (7-8) 2003,1115-1119
22. Stephan Denifl, Stefan Metejcik, Sylwia Ptasinska, Bettina Gstir, Michael Probst, Paul Scheier, Eugen Illenberger and Tilmann D. Marrk Electron attachment to chlorouracil: A comparison between 6-ClU and 5-ClU J. Chem. Phys. 120 (2004) 704-709. (3,4)
23 Andrzej Pelc, Wolfgang Sailer, Paul Scheier, Tilmann D. Maerk, Eugen Illenberger Dissociation of Organic Acids by Subexcitation Electrons Chem. Phys. Letters (accepted).(3,4)
24. Fragmentation of Propanoic Acid by Subexcitation Electrons
Andrzej Pelc, Wolfgang Sailer, Paul Scheier, Tilmann D. Märk,Eugen Illenberger
Chem. Phys. Letters 392 (2004) 465-469.(3,4)
25. Electron attachment to uracil, thymine and cytosine
S. Denifl, S. Ptasinska, G. Hanel, B. Gstir, P. Scheier, M. Probst, B. Farizon, M. Farizon, S. Matejcik, E. Illenberger, T. D. Märk (3,4)
Physica Scripta T 110 (2004) 252-255
26 S Denifl, S. Ptasinska, P. Scheier and T.D. Märk - Electron impact ionization of 5- and 6-chlorouracil: appearance energies. Int. J. Mass Spectrom. 232 (2) 2004, 99-105
27 Denifl, S. Ptasinska, G. Hanel, B. Gstir, M. Probst, P. Scheier and T.D. Märk - Electron attachment to gas-phase uracil. J. Chem. Phys. 120 (14) 2004, 6557-6565
28 Ptasinska, S. Denifl, P. Scheier and T.D. Märk - Inelastic electron interaction (attachment/ionization) with deoxyribose. J. Chem. Phys. 120 (18) 2004, 8505-8511
Virtual Journal of Biological Physics Research 7 (9) 2004
29. S. Denifl, S. Ptasińska, M. Probst, J. Hrusak, P. Scheier and T.D. Märk - Electron attachment to the gas phase DNA bases cytosine and thymine. J. Phys. Chem. A 108 (31) 2004, 6562-6569
30 S. Ptasinska, St. Denifl, V. Grill, P. Scheier, T.D. Märk, S. Gohlke, M.A. Huels and E. Illenberger
Bond-selective H^- abstraction from thymine
Angew. Chem. Int. Ed. 44 (2005) 1647-1650.(3,4)
31. Bindungsselektive H^- Abstraktion von Thymin
S. Ptasinska, St. Denifl, V. Grill, P. Scheier, T.D. Märk, S. Gohlke, M.A. Huels and E. Illenberger Bindungsselektive H^- Abstraktion von Thymin
Angew. Chem. 117 (2005) 2-5.(3,4)
32. S Ptasińska, P. Limão-Vieira, S. Denifl, P. Scheier and T. D. Märk - Electron attachment to monomeric and dimeric forms of glycolaldehyde. Chem. Phys. Lett. 401 (1-3) 2005, 227-231
33 S. Ptasińska, S. Denifl, P. Candori, S. Matejcik, P. Scheier and T. D. Märk - Dissociative electron attachment to gas phase alanine. Chem. Phys. Lett. 403 (1-3) 2005, 107-112
34 Bond- and Site- Selective Loss of H^- from Pyrimidine Bases
Sylwia Ptasinska, Stephan Denifl, Eugen Illenberger, Paul Scheier, Tilmann D. Maerk

Phys. Rev. Letters 95 (2005) 093201/1-093201/4.(3,4)
35 Bond-selective dissociative electron attachment to thymine
S. Ptasinska, S. Denifl, B, Mróz, M. Probst, V. Grill, E. Illenberger, P. Scheier,
T. D. Märk J. Chem. Phys. 123 (2005) 124302/1-124302/8. (3,4)
36. S Ptasińska, S. Denifl, P. Scheier and T. D. Märk - Electron impact ionization of glycolaldehyde. Int. J. Mass Spectr. 243, 2005, 171-176
37 . Smolira, S. Ptasińska, M. Smolira and L. Michalak - Matrix-assisted laser desorption/ionization detection of hemoglobin from long-stored samples of human blood. Vacuum 78, 2005, 655-660
38 S. Ptasińska, P. Candori, S. Denifl, S. Yoon, V. Grill, P. Scheier and T. D. Märk – Dissociative ionization of the nucleosides thymine and uridine by electron impact. Chem. Phys. Lett. 409, 2005, 270-276
39 Bond and site selective loss of H from nucleobases by low energy electrons (0-3 eV)
Sylwia Ptasinska, Stephan Denifl, Paul Scheir, Eugen Illenberger, Tilmann D. Märk
Angew. Chem Int. Ed. 44 (2005) 2-5.(3,4)
40. Bindungs-und ortsselektive Abspaltung von H-Atomen aus Nucleobasen, induziert durch Elektronensehr niegriger Energie (< 3 eV)
Sylwia Ptasinska, Stephan Denifl, Paul Scheir, Eugen Illenberger, Tilmann D. Märk
Angew. Chem. 117 (2005) 2-6.(3,4)
41 S. Ptasińska, S. Denifl, V. Grill, T. D. Märk, E. Illenberger and P. Scheier - Bond- and site-selective loss of H^- from pyrimidine bases - Phys. Rev. Lett. 95, 2005, 093201
and Virtual Journal of Biological Physics Research 10 (5) 2005 (3,4)
42 S. Denifl, S. Ptasińska, B. Sonnweber, P. Scheier, D. Liu, F. Hagelberg, J. Mack, L. T. Scottand T. D. Märk, Free-electron attachment to coronene and corannulene in the gas phase. J. Chem. Phys. 123, 2005, 104308
43. Ptasińska, S. Denifl, B. Mróz, M. Probst,V. Grill, E. Illenberger, P. Scheier, and T. D. Maerk - Bond selective dissociative electron attachment to thymine. J. Chem. Phys123, 2005, 124302(3,4)
44. S Ptasinska, S. Denifl, P. Scheier, T. D. Märk and E. Illenberger, Bond and site selective loss of H from gas phase nucleobases by very low energy electrons (< 3 eV). Angew. Chem. Int. Ed. (in print) 2005 (3,4)

Slovakia Group(subnode)

1. W Sailer, H Drexel, A Pelc, NJ Mason, E Illenberger, JD Skalny, T Mikoviny, P Scheier, and TD Märk.
Low Energy Electron Attachment to SF5CF3
Chem. Phys. Lett. 351 (2002), 71-78. (1,3,4(
2. NJ Mason, JD Skalny, and S Hadj-Ziane.
Experimental Investigations and Modelling Studies of Ozone Producing Corona Discharges
Czech. J. Phys. 25 (2002), 85-94. (1,3)
3. JD Skalný, T Mikovíny, NJ Mason and V Sobek.
The Effect of Gaseous Diluents on Ozone Generation from Oxygen
Ozone Science and Engineering 23 (2002), 29-37.(1,3)
4. W Sailer, H Drexel, V Grill, A Pelc, B Gstir, M Hanel, M Probst, NJ Mason, E Illenberger, J Fedor, JD Skalny, P Scheier, TD Mark.
Negative and positive ionisation processes in SF5-CF3
Proc. of SAPP Going/Kitzbuhel (Austria), February 2002, pp. 201-204. (1,3,4)
5. P Cicman, JD Skalny, and TD Mark.
Dissociative electron attachment to ozone: Rate constant
Proc. of SASP Going/Kitzbuhel (Austria), February 2002, pp. 269-272.

6. L Feketeova, JD Skalny, G Hanel, B Gstir, TD Märk.
   Dissociative electron attachment to Cl2
   Book of Abstracts 2nd LEEMI, (Edit. B. Pezler and I. Szamrej-Forys), Chlewiska/Siedlce (Poland) 2002, p. 99-100.
7. F Pontiga, C Soria, A Castellanos, JD Skalny.
   Physicochemical modeling of negative corona discharge: the effect of boundaries
   Proc. of 2002 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, (ISBN 0-7803-7502-85 IEEE Dielectrics and Insulation Society, Cancun, Quintana Roo, (Mexico), October 2002, pp.797-800.
8. P Cicman, M Francis, JD Skalny, TD Märk.
   Rate constant for dissociative electron attachment to ozone
   Conference Proceedings of Joint Conference ESCAMPIG 16th and ICRP 5th , (Edit. N. Sadeghi and H. Sugai), European Physical Society, GRENOBLE (France) 2002, p. 51-52.
9. Anto Tri Sugiarto, M Sato, T Ohshima, JD Skalny.
   Characteristics of ring-to-cylinder type electrode system on pulsed discharge in water
   J. Adv. Oxid. Technol. 5 (2002), 211-216.
10. L Aubrecht, J Koller, S Matejcik, JD Skalny.
    Spectroscopic study of corona discharges on coniferous trees
    Czech. J. Phys. 52 (2002), Suppl.D, D458-D464.
11. JD Skalny and NJ Mason.
    The effect of halomethane impurities on ozone generation from oxygen in DC negative corona discharge
    Ozone Sci. & Engineering 23 (2002), 329-341. (1,3)
12. Anto Tri Sugiarto, S Ito, T Ohshima, M Sato, JD Skalny.
    Oxidative decoloration by pulsed discharge plasma in water
    J. Electrost. 58 (2003), 135-145.
13. JD Skalny, S Matejcik, T Mikoviny, TD Märk.
    Effect of temperature on dissociative electron attachment to CCl2F2
    Int. J. Mass Spectrom. 223-224 (2003), 217-227.
14. S Matejcik, V Foltin, M Stano, JD Skalny.
    Temperature dependencies in dissociative electron attachment to CCl4, CCl2F2, CHCl3 and CHBr3
    Int. J. Mass Spectrom. 223-224 (2003), 9-19.
15. L Feketeova, JD Skalny, G Hanel, B Gstir, M Francis, TD Märk.
    Production of Cl- via dissociative electron attachment to Cl2
    Int. J. Mass Spectrom. 223-224 (2003), 661-667.
16. P Cicman, M Francis, JD Skalny, TD Märk.
    The ion extraction efficiency in crossed beams experiment using a trochoidal monochromator
    Int. J. Mass Spectrom. 223-224(2003), 271-278.
17. JD Skalny, NJ Mason, T Mikoviny.
    Corona discharge in gaseous mixtures: Generation of Ozone
    Balkan Rev. Phys. (2003), article in press. (1,3)
18. P Cicman, M Francis, JD Skalny, S Matejcik and TD Märk.
    The Rate Constant for Dissociative Electron Attachment to Ozone Revisited
    Czech. J. Phys. 53(2003), 181-190.
19. F Pontiga, C Soria, A Castellanos, JD Skalny.
    A study of ozone generation by negative corona discharge through different plasma chemistry models
    Ozone Sci. and Engineering 24(2002), 447-462.
20. F Pontiga, C Soria, A Castellanos, JD Skalny.
    Physico-Chemical modelling of negative corona discharge in oxygen

Ozone Generation, Proc. of 14th SAPP, Liptovský Mikuláš, (Edit P. Šutta, J. Müllerova, R. Bruner) ISBN 80-8040-195-0 (2003), p. 126-127.
21. M Stano, S Matejcik, JD Skalny and TD Märk.
Electron Impact ionization of CH4: Ionization energies and temperature effects
J. Phys. B.: At. Mol. Opt. Phys. 36 (2003), 261-271.
22. A Schramm, MW Ruf, M Stano, S Matejcik, II Fabrikant and H Hotop.
High-resolution study of dissociative electron attachment to dipolar molecules at low energies: CH2Br2 and CCl3Br
J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 4179–4202
23. S Denifl, B Gstir, G Hanel, L Feketeova, S Matejcik, K Becker, A Stamatovic, P Scheier and TD Märk.
Multiple ionization of helium and krypton by electron impact close to threshold: appearance energies and Wannier exponents
J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 4685–4694
24. B Gstir, S Denifl, G Hanel1, M Rümmele, T Fiegele, P Cicman, M Stano, S Matejcik, P Scheier, K Becker, A Stamatovic and TD Märk.
Electron impact multiple ionization of neon, argon and xenon atoms close to threshold: appearance energies and Wannier exponent
J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 2993–3007
25. J Langer, S Matejcik and E Illenberger.
Energy balance in dissociative electron attachment to C2F5I
Phys. Chem. Chem. Phys. (2002), 4, 5105–5109 (3,4)
26. J Langer, S Matejcik and E Illenberger.
Electron attachment to C2F5I molecules and clusters
International Journal of Mass Spectrometry 220 (2002) 211–220 (3,4)
27. J Langer, M Stano, S Gohlke, A Rosa, W Barszczewska, S Matejcik, E Illenberger.
Low energy (0–15 eV) electron stimulated reactions in single 1,2-C2F4Cl2 molecules and clusters
International Journal of Mass Spectrometry 223–224 (2003) 193–204 (3,4)
28. M Stano, V Foltin, S Matejcik, J Langer, S Gohlke and E Illenberger.
Dissociative electron attachment study to CHBr3 and CHI3
J. Phys. B: At. Mol. Opt. Phys. 36 (2003) 443-453 (3,4)
29. S Denifl, S Matejcik, B Gstir, G Hanel, M Probst, P Scheier and TD Märk.
Electron attachment to 5-chloro uracil
J. Chem. Phys., 118 (2003) 4107-4114
30. P Cicman, A Pelc, W Sailer, S Matejcik, P Scheier, TD Märk.
Dissociative electron Attachment to CHF2Cl
Chem. Phys. Lett., 371 (2003) 231-237
31. M Morvova, I Morva, M Janda, F Hanic, P Lukac.
Combustion and carbonization exhaust utilisation in electric discharge and its relation to prebiotic chemistry
Intern. J. Mass Spectrom. 223-224 (2003) 613-625
32. P Lukac, W Lindinger, I Morva, L Holubcik.
Energy dependence of the reaction rate constant of Ar+,Ar++ and N2+ ions with Cl2
Contributions to XIII Symp. on Atomic and Surface Physics - SASP, Going, 17-23 February 2002, (Edit. P.Scheier, T.D.Maerk), Univ. Innsbruck, 2002, pp. 153-156
33. M Morvova, I Morva, P Lukac.
Atmosfericke electricke vyboje pre katalyzu ekologicky vyznamnych reakcii (Atmospheric Electrical Discharges for catalysis of ecological important reactions)
12th conf. of Slovak Physicists, Proceedings, (Edit. M.Reiffers, L.Just), Slovak Phys. Soc., Kosice, 2002, pp.50-51, ISBN 80-968655-5-2

34. S. Ptasińska, P. Limão-Vieira, S. Denifl, P. Scheier and T. D. Märk - Electron attachment to monomeric and dimeric forms of glycolaldehyde. Chem. Phys. Lett. 401 (1-3) 2005, 227-231
35. S. Ptasińska, S. Denifl, P. Candori, S. Matejcik, P. Scheier and T. D. Märk - Dissociative electron attachment to gas phase alanine. Chem. Phys. Lett. 403 (1-3) 2005, 107-112
36. S. Ptasinska, S. Denifl, V. Grill, T. D. Märk, P. Scheier, S. Gohlke, M. A. Huels and E. Illenberger – Bond-selective H- abstraction from thymine. Angew. Chem. Int. Ed. 44 (11) 2005, 1647 – 1650 (3,4)
37. S. Ptasińska, S. Denifl, P. Scheier and T. D. Märk - Electron impact ionization of glycolaldehyde. Int. J. Mass Spectr. 243, 2005, 171-176
38. A. Smolira, S. Ptasińska, M. Smolira and L. Michalak - Matrix-assisted laser desorption/ionization detection of hemoglobin from long-stored samples of human blood. Vacuum 78, 2005, 655-660
39. S. Ptasińska, P. Candori, S. Denifl, S. Yoon, V. Grill, P. Scheier and T. D. Märk – Dissociative ionization of the nucleosides thymine and uridine by electron impact. Chem. Phys. Lett. 409, 2005, 270-276
40. S Matejcik, I Ipolyi and E Illenberger.
    Temperature Dependence of Dissociative Electron Attachment to CH2ClBr: Competition between Cl- and Br- Formation
    Chem. Phys. Lett. (submitted February 2003).(3,4)
41. Stephan Denifl, Stefan Metejcik, Sylwia Ptasinska, Bettina Gstir, Michael Probst, Paul Scheier, Eugen Illenberger and Tilmann D. Marrk Electron attachment to chlorouracil: A comparison between 6-ClU and 5-ClU J. Chem. Phys. **120** (2004) 704-709. (3,4)
42. Low energy electron driven reactions in single formic acid molecules HCOOH) and their homogeneous clustersI. Martin, T. Skalicky, J. Langer, H. Abdoul-Carime, G. Karwasz, E. Illenberger, M. Stano and St. Matejcik Phys. Chem. Chem. Phys. 7 (2005) 2212 – 2216.(3,4)

Partner 4: FUB Institut fuer Physikalische und Theoretische Chemie, Freie Universitaet

1. WF Schmidt, E Illenberger, AG Khrapak, Y Sakai and K Yoshino.
   Electronic processes in liquid helium
   J. Soc. Elect. Mat. Eng. 10 (2002) 155-156.
2. WF Schmidt, E Illenberger and Y Katsumi.
   On the processes of photo-induced desorption of sodium atoms from poly-dimethylsiloxane
   J. Soc. Elect. Mat. Eng. 10 (2002) 265-266.
3. W Sailer, H Drexel, A Pelc, V Grill, NJ Mason, E Illenberger, JD Skalny, T Mikoviny, P Scheier, and TD Märk.
   Low Energy Electron Attachment to SF5CF3
   Chem. Phys. Letters 351 (2002) 71-78. (1,3,4)
4. J Langer, S Matejcik, E Illenberger.
   Electron Attachment to C2F5I Molecules and Clusters
   Int. J. Mass Spectrom. 220 (2002) 211-220. (3,4)
5. WF Schmidt, E Illenberger, AG Khrapak, Y Sakai, K Yoshino.
   Electronic processes and electric breakdown of liquid helium
   Proceedings of 2002 IEEE International Conference on Dielectric Liquids, 14th, Graz, Austria, July 7-12, 2002 (2002) 159-162.
6. AG Khrapak, WF Schmidt, and E Illenberger.
   Charged particles in the bulk and near the surface of a non-polar liquid dielectric
   Proceedings of 2002 IEEE International Conference on Dielectric Liquids, 14th, Graz, Austria, July 7-12, 2002 (2002) 71-77.
7. K Yoshino, AG Khrapak, E Illenberger, and WF Schmidt.
   Structure and energy spectrum of negative ions in non-polar liquids

Proceedings of 2002 IEEE International Conference on Dielectric Liquids, 14th, Graz, Austria, July 7-12, 2002 (2002) 56-58.
8. R Balog, N Hedhili, F Bournel, M Penno, M Tronc, R Azria, E Illenberger.
   Synthesis of Cl2 Induced by low Energy (0-18 eV) Electron Impact to Condensed 1,2-C2F4Cl2 Molecules
   Phys. Chem. Chem. 4 (2002) 3350 – 3355. (4,8)
9. S Gohlke, A Rosa, F Bruening, MA Huels and E Illenberger.
   Formation of Anion Fragments from Gas Phase Glycine by Low Energy (0-15 eV)Electron Impact
   J. Chem. Phys. 116 (2002) 10164-10169.
10. A Pelc, W Sailer, P Scheier, M Probst, NJ Mason, E Illenberger and TD Märk.
    Dissociative Electron Attachment to Formic Acid (HCOOH)
    Chem. Phys. Letters 361 (2002) 277. (1,3,4)
11. W Sailer, A Pelc, S Matejcik, P Scheier, E Illenberger and TD Märk.
    Dissociative Electron Attachment Study to Nitromethane
    J. Chem. Phys. 117 (2002) 7989-7994. (3,4)
12. J Langer, S Matejcik, E Illenberger.
    Energy Balance in Dissociative Attachment to C2F5I
    Chem. Phys. Phys. Chem. 4 (2002) 5105 - 5109.
13. S Gohlke and E Illenberger. (3,4)
    Probing Biomolecules: Gas Phase Experiments and Biological Relevance
    Europhysics news 33 (2002) 207-209.
14. J Langer, M Stano, S Matejcik, S Gohlke, A Rosa, W Barszewska and E Illenberger.
    Electron Attachment to 1,2-C2F4Cl2 Molecules and Clusters
    Int. J. Mass Spectrom. 223-224 (2003) 193-204. (3,4)
15. M Stano, V Foltin, S Matejcik J Langer, S Gohlke, and E Illenberger.
    Dissociative Electron Attachment to CHBr3 and CHI3
    J. Phys. B: At. Mol. Opt Phys. 36 (2003) 443-452 (3,4)
16. E Illenberger.
    Formation and Evolution of negative ion resonances at surfaces
    Surf. Sci. 528 (2003) 67-77.
17. A Pelc, W Sailer, P Scheier, NJ Mason, E Illenberger and TD Märk.
    Electron Attachment to Simple Organic Acids
    Vacuum 20 (2003) 429-433. (1,3,4)
18. WF Schmidt and E Illenberger,
    Low Energy Electrons in Non-Polar Liquids
    Nukleonika 48 (2003) 75-82.
19. E Illenberger.
    Loucas G. Christophorou. On the Occasion on his 65th birthday
    Nukleonika 48 (2003) 65.
20. H Drexel, W Sailer, V Grill, P Scheier, E Illenberger and TD Märk.
    Electron Attachment to C2Cl4 and Trojan Horse Ionisation
    J. Chem. Phys. 118 (2003) 7394-7400. (3,4)
21. Formation of Negative Ions from Gas Phase Halo-Uracils by Low-Energy (0-18 eV) Electron Impact
    Int. J. Mass Specrom. 228 (2003) 703 -716.
22. E Krishnakumar, D Nandi, A Rosa, W-F Schmidt and E Illenberger.
    Low Energy Electron Impact to Hydrogen Peroxide: A Very Effective Source for OH Radicals and OH- Anions
    Chem. Phys. Letters (in print).

23. G Hanel, B Gstir, PS Denifl, P Scheier, B Farizon, M Farizon, E Illenberger and TD Märk. Electron Attachment to Uracil: Effective Destruction at Subexcitation Energies Phys. Rev. Letters 90 (2003) 188104-1 – 188104-4. (3,4)
24. S Matejcik, I Ipolyi and E Illenberger. Temperature Dependence of Dissociative Electron Attachment to CH2ClBr: Competition between Cl- and Br- Formation Chem. Phys. Lett. (submitted February 2003).(3,4)
25. W Sailer, A Pelc , P Scheier, M Probst, J Limtrakul , E Illenberger and TD Märk. Low energy electron attachment to acetic acid Chem. Phys. Letters Chem. Phys. Letters 378 (2003) 250-256. (3,4,1)
26. DI Zhukhovitskii, WF Schmidt and E Illenberger. Electron detachment from negative ions at the surface of a solid JETP (Translation of Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki) **97** (2003) 606-614.
27. A.V. Berezhnov, A. G. Khrapak, E. Illenberger, W.F. Schmidt Anomalous Mobility of Negative Charges in Liquid Hydrogen: A Model of Ionic Bubble High Temperature (Translation of Teplofizika Vysokikh Temperatur) 41 (2003), 425-427.
28. Werner F. Schmidt, Eugen Illenberger (Berlin), Alexey G. Khrapak (Moscow),Yosuke Sakai (Sapporo), Katsumi Yoshino (Osaka)Electronic Conduction and Breakdown in Liquid Helium and Liquid Neo IEEE Trans. Dielectr. Electr. Insul. 10 (2003) 1012-1021.
29. Low energy electron interaction with free and bound SF_5CF_3: negative ion formation from single molecules, clusters and nanofilms Richard Balog, Michal Stano, Paulo Limao-Vieira, Constanze Koenig, Ilko Bald, Nigel. J. Mason, Eugen Illenberger J. Chem. Phys. 119 (2003) 10396-10403.(3,1)
30. Hassan Abdoul-Carime, Sascha Gohlke, and Eugen Illenberger Dehydrogenation of Adenine Induced by Slow (< 3 eV) Electrons Chem. Phys. Letters 380 (2003) 595-599
31. Stephan Denifl, Stefan Metejcik, Sylwia Ptasinska, Bettina Gstir, Michael Probst, Paul Scheier, Eugen Illenberger and Tilmann D. Marrk Electron attachment to chlorouracil: A comparison between 6-ClU and 5-ClU J. Chem. Phys. 120 (2004) 704-709. (3,4)
32. R Balog and E Illenberger. Complete chemical transformation of a molecular film by subexcitation electrons Phys. Rev. Letters 91 (2003) –213201-1
33. Hassan Abdoul-Carime, Sascha Gohlke and Eugen Illenberger, Site Specific Dissociation of DNA Bases by Slow Electrons at Early Stages of Irradiation Phys. Rev. Letters 92 (2004) 168103-1.
34. Hassan Abdoul-Carime, Sascha Gohlke, Esther Fischbach Jessica Scheike and Eugen Illenberger Thymine Excision from DNA by Subexcitation Energies Chem. Phys. Letters 387 (2004)
35. Hassan Abdoul-Carime, Sascha Gohlke and Eugen Illenberger Conversion of Amino Acids by Electrons at Subexcitation Energies Physical Chemistry Chemical Physics (PCCP) **6** (2004) 161-164.
36. Tihomir Solomun, Arnd Schimanski, Heinz Sturm, Renate Mix and Eugen Illenberger Surface Modification of Polyamides by Direct Fluorination e-Polymers 008 (2004) 1-16.
37. Reactions of Amide Group with Fluorine as Revealed with Surface Analytics Tihomir Solomun, Arnd Schimanski, Heinz Sturm, Renate Mix and Eugen Illenberger Chem. Phys. Lett. 387 (2004) 312-316.
38. Judith Langer, Richard Balog, Sascha Gohlke, Michal Stano, Hassan Abdoul-Carime and Eugen Illenberger Low Energy Electron Driven Reactions in Free and Bound Molecules: From Unimolecular to Processes in the Gas Phase to Complex Reactions in a Condensed Environment Int. J. Mass Spectrometry 233 (2004) 267-291.
39. Andrzej Pelc, Wolfgang Sailer, Paul Scheier, Tilmann D. Maerk, Eugen Illenberger Dissociation of Organic Acids by Subexcitation Electrons Chem. Phys. Letters (accepted).(3,4)

40. Hassan Abdoul-Carime, and Eugen Illenberger Degradation of Vitamin C by Electrons Chem. Phys. Letters 390 (2004) 481-484.
41. Andrzej Rosa, Frank Brunning, S. V. K. Kumar and Eugen Illenberger Dissociative Electron Attachment to Excited SF_6: Selective IR Excitation Versus Thermal Activation Chem. Phys. Letters 391 (2004) 361-365.
42. Fragmentation of Propanoic Acid by Subexcitation Electrons
Andrzej Pelc, Wolfgang Sailer, Paul Scheier, Tilmann D. Märk,Eugen Illenberger
Chem. Phys. Letters 392 (2004) 465-469.(3,4)
43. Electron attachment to uracil, thymine and cytosine
S. Denifl, S. Ptasinska, G. Hanel, B. Gstir, P. Scheier, M. Probst, B. Farizon, M. Farizon, S. Matejcik, E. Illenberger, T. D. Märk (3,4)
Physica Scripta T 110 (2004) 252-255.
44. Degradation of N-Acetyl-Tryptophan by Low-Energy (<12 eV) Electrons
Hassan Abdoul-Carime, Sascha Gohlke, and Eugen Illenberger
J. Am. Chem. Soc. 126 (2004) 12158-12161.
45. Bromouridine Sensitization by Slow Electrons
Hassan Abdoul-Carime, Sascha Gohlke, Irina Petrushko, Paulo Limao-Vieira, Nigel Mason and Eugen Illenberger Chem. Phys. Letters 393 (2004) 442-447 (3,4,1)
46. A fluorescence based method to determine electron induced damage to DNA
Tihomir Solomun, Eugen Illenberger
Chem. Phys. Letters 396 (2004) 448-451.
47. Fragmentation of proline induced by slow electrons
H. Abdoul-Carime and E. Illenberger
Chem. Phys. Letters 397 (2004) 309-313.
48 Site-Specific Dissociation of DNA Bases by Slow Electrons at Early Stages of Irradiation
Hassan Abdoul-Carime, Sascha Gohlke and Eugen Illenberger
Phys. Rev. Letters 92 (2004) 168103.
49 Low energy electrons as a soft tool for surface modification
R. Balog and E. Illenberger
Gaseous Dielectrics X, L. G. Christophorou J. K. Olthoff and P. Vassiliou, eds.
Springer, New York (2004), pp. 41-46.
50 Electron attachment to biologically relevant molecules: Towards the initial molecular steps in
radiation damage S. Gohlke, H. Abdoul-Carime and E. Illenberger
Gaseous Dielectrics X, L. G. Christophorou J. K. Olthoff and P. Vassiliou, eds Springer, New York (2004), pp. 35-40.
51 Fragmentation of tryptophan by low-energy electrons
H. Abdoul-Carime, S. Gohlke and E. Illenberger
Chem. Phys. Letters 402 (2005) 497-502.
52 P. Tegeder, R. Balog, N. J. Mason and E. Illenberger
Electron stimulated desorption of Cl^- from adsorbed and condensed Cl_2: Effects of environment and orientation Physical Chemistry Chemical Physics 7 (2005) 685 - 690.
53 T. Sedlacko, R. Balog, A. Lafosse, M. Stano, St. Matejcik, R. Azria and E. Illenberger
Reactions in condensed formic acid (HCOOH) induced by low energy (< 20 eV) electrons
Phys. Chem. Chem. Phys. 7 (2005) 1277 – 1282.
54 S. Ptasinska, St. Denifl, V. Grill, P. Scheier, T.D. Märk, S. Gohlke, M.A. Huels and E. Illenberger
Bond-selective H^- abstraction from thymine
Angew. Chem. Int. Ed. 44 (2005) 1647-1650.
55 Bindungsselektive H^- Abstraktion von Thymin
S. Ptasinska, St. Denifl, V. Grill, P. Scheier, T.D. Märk, S. Gohlke, M.A. Huels and E. Illenberger Bindungsselektive H^- Abstraktion von Thymin

Angew. Chem. 117 (2005) 2-5.

56 Efficient formation of difluoroamino functionalities by direct fluorination of polyamides
T. Solomun, A. Schimanski, H. Sturm and E. Illenberger
Macromolecules 38 (2005) 4231-4236.

57 Electronic Excitations in Liquefied Rare Gases American Scientific Publishers (ASP) (2005), 471 W.-F. Schmidt, E. Illenberger (Editors)

58 Localized electrons, holes and ions W.-F. Schmidt, E. Illenberger and A.G. Khrapak
Electronic Excitations in Liquefied Rare Gases, Edited by W.-F. Schmidt and E. Illenberger, American Scientific Publishers (ASP) 2005, pp. 239

59 Rare gases under different stages of aggregation: Gas phase, clusters and films
R. Balog, M. Stano, W.-F. Schmidt and E. Illenberger
in Electronic Excitations in Liquefied Rare Gases, Edited by W.-F. Schmidt and E. Illenberger
American Scientific Publishers (ASP), 2004, pp. 413-428.

60 Low energy electron driven reactions in single formic acid molecules HCOOH) and their homogeneous clusters
I. Martin, T. Skalicky, J. Langer, H. Abdoul-Carime, G. Karwasz, E. Illenberger, M. Stano and St. Matejcik
Phys. Chem. Chem. Phys. 7 (2005) 2212 – 2216.

61 Electron stimulated desorption of anions from condensed XCN (X = Cl, Br):
State selectivity in the desorption of fragment anions
P. Tegeder and E. Illenberger
Chem. Phys. Letters 411 (2005) 175-180.

62 Bond- and Site- Selective Loss of H^- from Pyrimidine Bases
Sylwia Ptasinska, Stephan Denifl, Eugen Illenberger, Paul Scheier, Tilmann D. Maerk
Phys. Rev. Letters 95 (2005) 093201/1-093201/4.

63 The mobility of positive and negative ions in liquid xenon
Werner-F. Schmidt, Oliver Hilt, Alexey G. Khrapak and Eugen Illenberger
Radiation Physics and Chemistry 74 (2005) 152-159.

64 Beyond the Bragg Peak: Hyperthermal Heavy Ion Damage to DNA-Components
Zongwu Deng, Ilko Bald, Eugen Illenberger and Michael A. Huels
Phys. Rev. Letters 95 (2005) 153201/1-153201/4

65 Bond-selective dissociative electron attachment to thymine
S. Ptasinska, S. Denifl, B, Mróz, M. Probst, V. Grill, E. Illenberger, P. Scheier,
T. D. Märk J. Chem. Phys. 123 (2005) 124302/1-124302/8.

66 Bond and site selective loss of H from nucleobases by low energy electrons (0-3 eV)
Sylwia Ptasinska, Stephan Denifl, Paul Scheir, Eugen Illenberger, Tilmann D. Märk
Angew. Chem Int. Ed. 44 (2005) 2-5.

67. Bindungs-und ortsselektive Abspaltung von H-Atomen aus Nucleobasen, induziert durch Elektronensehr niegriger Energie (< 3 eV)
Sylwia Ptasinska, Stephan Denifl, Paul Scheir, Eugen Illenberger, Tilmann D. Märk
Angew. Chem. 117 (2005) 2-6.

68 Electron-driven molecular processes Petra Swiderek and Eugen Illenberger (editors)
Topical Issue, Eur. Phys. J. D 35 (2005) 173-441.

69 Electron-driven molecular processes: A general introduction E. Illenberger and P. Swiderek
Eur. Phys. J. D 35 (2005) 173-176.

70 Temperature dependence of electron attachment to $CHCl_2Br$: A crossed beams study
Imre Ipolyi, Stefan Matejcik and Eugen Illenberger
Eur. Phys. J. D 35 (2005) 257-260.

71 Decomposition of purine nucleobases by very low energy electron
Hassan Abdoul-Carime, Judith Langer Michael A. Huels and Eugen Illenberger
Eur. Phys. J. D 35 (2005) 399-404.

72 Modelling electron induced processes in „condensed“ formic acid: resonant states of $(HCOOH)_2^-$ at low energies
Franco A. Gianturco, Robert R. Luchese, Judith Langer, Isabel Martin, Michal Stano, Grzegorsz Karwasz, Eugen Illenberger
Eur. Phys. J. D 35 (2005) 399-404.

73 Microarray Technology for the study of DNA-damage by low energy electrons
T. Solomun, H. Hultschig and E. Illenberger
Eur. Phys. J. D 35 (2005) 437-441.

Partner 5: URLS. Dipartimento di Chemica Universita degli Studi di Roma 'La Sapienza', IT.

1 T Nishimura, FA Gianturco.
Positron-impact vibrational excitation of CH4: Comparing calculations with experiments
NIMB 192 (2002) 17

2 T Nishimura and FA Gianturco.
Vibrational excitation of methane by positron impact: Computed quantum dynamics and sensitivity tests
Phys. Rev. A 65 (2002) 062703

3 T Nishimura and FA Gianturco.
Vibrational excitation of methane by electron impact: a close coupling treatment
J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 2873

4 P Carsky, R Curik, FA Gianturco, RR Lucchese and M Polasek.
Computing the Exchange Interaction in Electron Scattering from Polyatomic Molecules
Phys. Rev. A 65 (2002) 052713 (5,7)

5 RR Lucchese and FA Gianturco.
Electron-Molecule Collisions in the Static-Exchange Correlation-Polarization Approximation
in: ICAM Data and their Applications, edited by DR Schultz, PS Krstic and F Ownby (AIP, New York, 2002) pg 213

6 T Nishimura and FA Gianturco.
Threshold efficiency of vibrational excitation of methane by electron/positron impact: a comparison
Europhys. Lett. 59 (2002) 674

7 FA Gianturco.
Positron and Positronium Physics in atomic and molecular gases: challenges for the 21st Century
Europhys. News, 33 (2003) 212

8 FA Gianturco, RR Lucchese and N Sanna.
Trapped metastable anions in low-energy electron scattering from C20 clusters
J. Chem. Phys, 118 (2003) 4013

9 A Occhigrossi and FA Gianturco.
Low-energy positron dynamics in small hydrocarbon gases
J. Phys. B 36 (2003) 1383

10 T Nishimura and FA Gianturco.
Virtual state formation in positron scattering from vibrating polyatomic molecules
Phys. Rev. Lett. 90 (2003) 18320-1

11 F.A. Gianturco, T.L. Gibson, P. Nichols, R.R. Lucchese and T. Nishimura Modelling dynamical correlation forces in low-energy positron scattering from polyatomic gases: a comparison for CH_4 Rad. Phys. Chem.68 (2003) 673

12 T. Nishimura and F.A. GianturcoThe scattering of positrons from CF_4 molecules at ultralow energies J. Phys. B: At. Mol. Opt. Phys. 37 (2004) 215

13 T. Nishimura and F.A. Gianturco Vibrational excitation of water by low-energy electron scattering: calculations and experiments Europhys. Lett. 65 (2004) 179
14 A Grandi, F.A. Gianturco, N. Sanna, R.R. Lucchese Low-energy electron scattering by c cubane: Resonant States and Ramsauer Features from quantum dynamics J. Chem. Phys. 120 (2004) 4172
15 T. Nishimura and F.A. Gianturco Computing vibrational effects in low-energy positron scattering from polyatomic targets: the H_20 and C_2H_2 stretching modes NIM-B 221 (2004) 24
16 F.A. Gianturco, R.R. Lucchese Radiation Damage of Biosystems Mediated by Secondary Electrons: Computing Dissociative Precursors in Uracil Molecules. J. Chem. Phys. 120 , 7446 (2004)
17 S. Telega, E. Bodo, F.A. GianturcoRotationally inelastic collisions of electrons with H_2 and N_2 molecules: A close-coupling calculations in space frameEur. Phys. J. D 29 (2004) 357
18 A Grandi, F.A. Gianturco, N. Sanna Resonant Formation of DNA Strand Breaks: H^- Desorption from Uracil via Metastable Electron Capture Phys. Rev. Lett. 93, 048103 (2004)
19 F.A. Gianturco and R.R. Lucchese Anionic Fragmentation of Glycine by Low-Energy Electrons: Resonant Precursors States from Scattering Calculations J. Phys. Chem. A 108 (2004) 7056
20 F.A. Gianturco and R.R. Lucchese Nanoscopic models for radiobiological damage: metastable precursor of dissociative electron attachment to formic acid New Journal of Physics, 6 (2004) 66
21 T. Nishimura and F.A. Gianturco Low-energy positron scattering Modelling the formation of bound $[Me^+]$ states in deformed polyatomic moleculesEurophys. Lett. 68 (2004) 377
22 J. Sabin Del Valle and F.A. Gianturco Collisional "heating" of molecular rotations by positron impact: a computational analysis of the quantum dynamics Phys. Chem. Chem. Phys., 7 (2005) 318
23 S. Irrera and F.A. GianturcoVibrational excitation of CF_4 by electron impact: a computational analysis New Journal of Phys. 7 (2005) 1
24 T . Nishimura and F.A. GianturcoVibrational excitation of H_2O by collision with positrons: a computational study Eur. Phys. J. D 33 (2005) 221
25 J. Sabin Del Valle, E. Bodo and F.A. Gianturco Rotational cooling of molecular gases by positron impact at vanishing collision energies J. Phys. Mol. B: At. Mol. Opt. Phys. 38 (2005) 206
26 T. Nishimura and F.A. Gianturco Enhanced positron annihilation in small hydrocarbons: threshold effects from symmetric bond stretching Phys. Rev. A 72 (2005) 022706
27 S. Telega and F.A. Gianturco Vibrationally Inelastic electron-H_2 scattering revisited: coupled-channel space-frame calculations with model interactions Eur. Phys. J. D (2005) (in press)
28 F.A. Gianturco, E. Illenberger and R.R. Lucchese Computational modelling of electron-induced processes in "condensed" formic acid: Resonant states of $(HCOOH)_2$ by electron impact Eur. Phys. J. D (2005) (in press)

Trento University - subnode

Landolt-Börstein New Series, Volume I/17.
Photon and Electron Interaction, with Atoms, Molecules and Ions.
Chapter VI.1. Electron Scattering with Molecules. Total.
A.Zecca, G.P.Karwasz, R.S.Brusa, p. 6.1-6.51, Springer-Verlag, Berlin, Heidelberg, 2003

1. Total cross sections for positron scattering on argon and krypton at intermediate and high energies, G. P. Karwasz, M. Barozzi, R.S. Brusa, A. Zecca, Nuclear Instruments and Methods in Physical Research B 192 (2002) 157
2. Low-energy electron collisions in nitrogen oxides: a comparative study

A. Zecca, G. P. Karwasz, R. S. Brusa and T. Wróblewski, Int. J.Mass Spectr. 223-224 (2003) 205

3. J. Mechlińska-Drewko, T. Wróblewski, Z. Lj. Petrović, V. Novaković and G. P. Karwasz, Electron scattering on N_2O - from cross sections to diffusion coefficients Radiation in Physics and Chemistry Journal, 68 (2003) 205
4. A novel set-up for positron scattering in gases, A. Zecca, R.S. Brusa, M. Bettonte, E. Rajch, S. Mariazzi and G.P. Karwasz, Radiation in Physics and Chemistry Journal, 68 (2003) 319-22
5. Dissociation Energy of Protonated Water Clusters, T. Wróblewski, L. Ziemczonek, E. Gazda and G. P. Karwasz, Radiation in Physics and Chemistry Journal, 68 (2003) 313-318
6. Semiempirical analysis of electron scattering cross sections in N_2O and CO_2,T. Wróblewski, G. P. Karwasz, H. Nowakowska, J. Mechlinska-Drewko, V. T. Novakovic, Z. Lj. Petrovic, Czechoslovak Journal of Physics, 54 (2004), Suppl. C, C742
7. Proton transfer reactions for ionized water clusters, T. Wróblewski, L. Ziemczonek, G. P. Karwasz, Czechoslovak Journal of Physics 54 (2004), Suppl. C, C747
8. Formation Paths of Positively Ionized Water Clusters, T. Wróblewski, L. Ziemczonek, G. P. Karwasz, Molecular Physics Reports 39 (2004) 255
9. Total cross sections for positron scattering on benzene G. P. Karwasz, A. Zecca, D. Pliszka, R. S. Brusa and M. Bettonte, J. Phys. B 2005 (submitted)
10. Virtual positronium resonances in helium G.P. Karwasz, R.S. Brusa, D. Pliszka, C. Perazzolli, A. Zecca, Phys. Rev. Lett. 2005 (submitted)

Partner 6:UAR University of Aarhus, DK

1 Giant Resonances in cold electron scattering by CS_2 N.C.Jones, D. Field, J.-P.Ziesel and T.A.Field, Physical Review Letters, 89, 93201, 2002

2 Cold Collisions of electrons with molecules. D. Field, N.C.Jones, J.-P.Ziesel, T.A.Field Few Body Systems. Volume 31, 191-197, 2002

3 An undulator-based spherical grating monochromator beamline for low energy electron-molecule scattering experiments. Hoffmann, S. V.; Lunt, S.L.; Jones, N.C.; Field, D.; Ziesel, J.-P. Rev. Sci. Instrum. (2002) vol.73, (12), 4157-4163 (publication with Toulouse subnode)

4 Reaction and Scattering in cold electron collisions: J. P. Ziesel, N. C. Jones, D. Field, and L. B. Madsen, Phys. Rev. Lett. 90, 083201-1 (2003) (publication with Toulouse subnode)

5 Time delays in cold elastic scattering: D.Field and L.B.Madsen, J.Chem.Phys. , 118, 1679-83, 2003

6 Cold electron scattering in SF_6 and C_6F_6: bound and virtual state channels: D. Field, N.C. Jones, and J.-P. Ziesel, Phys. Rev. A, 69 052716-1 (2004) (publication with Toulouse subnode).

7 Virtual state scattering with cold electrons: para-xylene and para-difluorobenzene, N.C.Jones, D. Field, J.-P.Ziesel and T.A.Field, J.Chem.Phys 122, 74301 (2005) (publication with Toulouse subnode).

8 The determination of absolute electron anion formation cross-sections from beam scattering data , J.P. Ziesel, N. C. Jones and D.Field and L B Madsen, J.Chem.Phys. 122 24309 (2005) (publication with Toulouse subnode).

9 Time Delays and Cold Collisions, D.Field, N C Jones and J-P Ziesel, 45-54, Electron Scattering, Ed. C.T.Whelan, N.J.Mason Kluwer Academic 2005 (publication with Toulouse subnode).

Partner 7: IPC Heyrovsky Institute of Physical Chemistry, Academy of Sciences of the Czech Republic

1. P Carsky, R Curik, FA Gianturco, RR Lucchese and M Polasek.
   Computing the Exchange Interaction in Electron Scattering from Polyatomic Molecules
   Phys. Rev. A 65 (2002) 052713 (5,7)
2. Vibrationally inelastic electron scattering on polyatomic molecules by the discrete momentum representation (DMR) method
   J.Phys.B 36, 2165 (2003) (7,5)
3. R. Curík and P. Carsky: Vibrationally inelasic electron scattering on polyatomic molecules by the discrete momentum representation (DMR) method.J. Phys. B 36, 2165 (2003)
4. D.B.Popovic, D.E. David, J. Michl, R. Curík and P. Carsky
   Joint experimental and theoretical study of vibrationally inelastic electron scattering on propane. J. Chem. Phys. 121, 10551 (2004)
5. P. Carsky, R. Curík: in Computational Chemistry: Reviews of Current Trends, Vol. 11, World Scientific, Singapore, in press
6. P. Carsky, R. Curik, P. Papp and P. Hrusc: Ab initio calculations of vibrational excitation of methane by electron impact. In preparation
7. R. Curik and D. Field: Rotational excitation of molecules by cold electrons. In preparation.
8. J. Horacek, M. Cizek, P.Kolorenc and W. Domcke: Isotope effects in vibrational excitation and dissociative electron attachment of DCl and DBr. Eur. Phys. J. D 35, 225 (2005).
9. P. Kolorenc, V. Brems, J.Horacek: Computing resonance positions, widths, and cross sections via Feshbach-Fano R-matrix method: Application to potential scattering. Phys. Rev. A 72, 012708 (2005).

Partner 8 UPSO Laboratoire des Collisions Atomiques et Moléculaires Université Paris-Sud, Orsay, France

1. DC Marinica, C Ramseyer, AG Borisov, D Teillet-Billy, JP Gauyacq, W Berthold, P Feulner, U Höfer.
   Effect of an atomically thin dielectric film on the surface electron dynamics: image potential states in the Ar/Cu(100) system
   Phys.Rev.Lett. 89 (2002) 046802
2. A Hoffman, S Ustase, M Hadj Hamou, MN Hedhili, J-P Guillotin, A Laiktman and R Azria.
   Decay of secondary electron emission and surface charging induced by resonant electron attachment to hydrogenated diamond films
   J. of applied Phys. Vol. 91, 7, 4726, 2002
3. R Balog, MN Hedhili, F Bournel, M Penno, M Tronc, R Azria, E Illenberger.
   Synthesis of Cl2 induced by low energy electron impact to condensed C2F4Cl2 molecules
   Phys. Chem. Chem. Phys., 4 (14) 3350-5, 2002
4. A Hoffman, A Laikhtman, R Azria, Y Le-Coat, M Hadj Hamou and M Tronc.
   Stimulated desorption of D- from Diamond: surface versus sub-surface processes via resonance dissociative electron attachment
   Diamond and Related Materials, 11 (3-6) 867-71, 2002
5. A Laikhtman, Y Le-Coat, M Hadj Hamou , R Azria and A Hoffman.
   The mechanism of low energy ESD of O- from hydrogenated and hydrogen free Diamond surfaces exposed to activated oxygen
   J. Chem.Phys., 117, 346-52, 2002
6. A.Lafosse, D. Teillet-Billy, J.P. Guillotin, Y. Le Coat, R. Azria, A. Laikhtman, A. Hoffman
   Role of electronic band structure and resonances on electron reflectivity and vibrational excitation functions : the case of hydrogenated diamond Phys. Rev. B 68 (2003) 235421

7. A.Laikhtman, A. Lafosse, Y. Le Coat, R. Azria, A. Hoffman Clarification oxygen bonding on diamond surfaces by low energy electron stimulated desorption and high resolution electron energy loss spectroscopy J. Chem. Phys. 119 (2003) 1794
8. DC Marinica, C Ramseyer, AG Borisov, D Teillet-Billy, JP Gauyacq. Image states on a free electron metal surface covered by an atomically thin insulator layer Surf. Sci. 528 (2003) 78
9. A. Hoffman, R. Akhvlediani, A. Laikhtman, A. Lafosse, J.-P. Guillotin, and R Azria Effect of incident current and energy on surface charging and electron emission of hydrogenated diamond films induced by low energy electron irradiation. J. Appl. Phys. **95**, 1895-1899 (2004)
10. A. Lafosse, M. Bertin, D. Cáceres, C. Jäggle, P. Swiderek, D. Pliszka, and R.Azria Electron induced functionalization of Diamond by small organic groups Eur. Phys. J. D 35 (2005) 363
11. T.Sedlacko, R.Balog, A.Lafosse, M.Stano, S.Matejcik, R.Azria, and E.Illenberger Reactions in condensed formic acid (HCOOH) induced by low energy (<20 eV) electrons Phys. Chem. Chem. Phys.**7** (6), 1277 – 1282 (2005)
12. A. Lafosse, D. Cáceres, M. Bertin, B.P Marinković and R. Azria Reinvestigation of electron impact vibrational excitation mechanisms of 1H/Si(100)-(2×1) surfaces. Surf. Sci. **578** (1-3), 102-107 (2005))

Part B

Comparison with the Joint programme of work (ANNEX 1 of the Contract)

B1: Project Objectives

The major objectives of the proposed Network were to:
(i) Train young researchers in the latest experimental and theoretical techniques for studying electron/positron induced chemistry by providing them with the opportunity to undertake research within internationally renowned research centres.
(ii) Provide the most co-coordinated study ever undertaken, either experimental or theoretical, of the fundamental chemistry initiated by the irradiation by electrons and positrons of molecules (from diatomic to macromolecules) and
(iii) To develop a new understanding of the basic processes by which such chemical reactions are induced and how such reactions are modified by their local environment.

In particular the Network aimed;
1. Study fundamental electron and positron energy transfer processes.
2. Study electron and positron impact dissociation processes yielding reactive neutral, anionic and cationic species.
3. Study how such processes are modified in the different phases of matter (gases, clusters and on surfaces.
4. Probe new reaction processes initiated in denser phases of matter (e.g. nucleophilic substitution).

Different molecular compounds have been selected to illustrate these processes in particular the halogenated hydrocarbons and fluorocarbons; simple biomolecules (e.g. the DNA and RNA bases and more recently simple sugars) and water. Excellent progress has been made towards achieving all these objectives

B2 Research method and Work plan

Experimental techniques

Authoritative investigations of electron/positron-molecule interactions requires the adoption of several different experimental methods within this Network all the current state-of-the-art experimental techniques for probing electron/positron induced reactions with molecules were adopted by the researchers in their ongoing studies and were made available to the younger researcher. Furthermore these techniques have been developed making the participants amongst the leading pioneers of techniques for producing sources of biomolecules for example recently UIBK has developed a technique for incorporating biomolecules into cold helium droplets while FUB and UBIK have produced clusters of biomolecules and FUB and OU are studying DNA itself. The UAR group has pioneered the development of the first synchrotron based photo-ionisation electron source, a source that is capable of producing electron beams with resolutions of 2 meV at incident energies as low as 1 meV. With such a source it is possible to study electron impact induced rotational excitation and makes it possible to probe threshold phenomena at the onset of each mode of molecular excitation and has led to the investigation of a new class of scattering processes, named cold collisions with the electrons at temperature comparable to those of cold atoms . Their instrument is now being developed to study such low energy interactions in the condensed phase.
The UCL team has developed corresponding methods for the investigation of single and multiply charged ionization (with and without positronium formation) including the first near-threshold measurements and the first complete (e,2e) type experiments with positrons. Techniques for generating positronium beams have also been developed and applied to the study of the interaction of simple atomic and molecular targets. Methods for extending these to more complex targets and probing those interactions that transfer energy directly into the target molecule are currently under

development with the appointment of younger members of the research network. This work has been complemented by the development of a new apparatus in Trento Italy (Sub node of URLS) high resolution positron-molecule scattering in

Experimental teams in Berlin (FUB) and Paris (UPSO) have pioneered the transfer of gaseous phase experimental and theoretical techniques into the study of electron molecule collisions upon surfaces and are recognized as international leaders in this field. Research performed this year through a collaboration of network members has led to a new understanding of state selective dissociation on surfaces with subsequent consequences for site selective chemistry using STM technology. Their collaborative work demonstrating that electron reactions can also bind *specific functional groups* to a surface in a controlled way has received international acclaim. In particular their demonstration that DEA of acetonitrile $CH_3CN + e^- \rightarrow CH_2CN^- + H$ can be used in the functionalization of hydrogenated diamond to attach organic groups to surfaces has great significance in the nanotechonology area where 'nanoscale lithography' may be induced by electron patterning.

UPSO and OU have also extended the researcher into a new area – that of astrochemistry, their research exploring pathways by which molecules may form in ices within the Interstellar medium. UPSO have demonstrated electrons induced CO_2 formation in condensed formic and acetic acids in a very wide range of energies (.7 to 20 eV). They have also shown that glycine is readily formed by electron irradiation of condensed mixtures of NH_3 and acetic acid while the OU team has demonstrated glycine formation in co deposited films of methylamine and CO_2 in both cases the glycine was found to be formed in the zwitterionic form.

Theoretical Methods

The UCL team has led the modern development of the R-Matrix method for treating electron interactions with molecules. For diatomic molecules the R-matrix method has been extended to the nuclear coordinate which has allowed for the first time full, *ab initio* non-adiabatic treatments of vibrational excitation and dissociative electron attachment. UCL have recently developed a novel procedure for treating near-threshold electron impact dissociation. In addition the UCL group has recently extended their code to treat polyatomic molecules with the first results for a complex biomolecule (Tetrahydrofuran) being obtained in 2005. This work is complemented by the team in Bonn (sub-node of FUB) who use a similar formalism and who from 2006 will share the code and development with the team in Prague. One of the younger members of the UCL theory group Dr J Gorfinkiel who has been a member of the EPIC network has recently been awarded a lectureship at the Open University and will establish a new research theoretical research group dedicated to electron/molecule scattering, an essential part of this will be collaborations with two other Network partners URLS and ICP. Finally in 2006 the UCL team will commence a new research programme using the R-matrix method to study theoretical interactions of low energy positrons with molecular targets. This work will be aided by employment of a former EPIC YR Dr K Franz.

In the past year the group at ULRS has:

- Successfully established a robust computational model which can treat several vibrational modes for nonlinear polyatomic molecules which become excited by either electron or by positron impact. This approach has been successful in reproducing partial, state-to-state cross sections that could be compared with the experimental findings.
- Studied the efficiency of attaching slow positrons to molecular targets in the gas phase and to relate the efficiency of such a process with the vibrational energy content of the molecular species in order to explain the enhanced annihilation rates found for polyatomic molecules in terms of their initial vibrational content.

- Set up a general physical and computational model for the study of the patterns for Dissociative Electron Attachment (DEA) observed experimentally for biological systems (e.g. the purine bases appearing along the DNA double helix structures) and which are held responsible for the detachment of several fragments depending on the electron energy and on the specific resonant states being formed.
- Analysed in some detail the efficiency of the rotational/vibrational excitation processes by both electrons and positrons on diatomic molecular gases at collision energies very close to the excitation thresholds or at ultralow collision energies in case of "hot" molecular targets undergoing collisional de-excitation

Thus the network has developed the research methods outlined in the original proposal pioneering several new methodologies such that internationally many of the Network participants have been recognized as international leaders in the field.

B3 Schedule and Milestones

The work plan was set out in terms of three inter-linked scientific strands namely the study of:

- Electron and positron induced reactions in the gaseous phase.
- Reactions in molecular clusters and aggregates and
- Reactions in the condensed phase.

For each of these strands four specific molecular targets have been chosen since these provide the opportunity to determine the reactivity as a function of particular site and/or chemical bond. The targets selected are:

- Halogenated hydrocarbons (CH_xR_y where R is any halogen species F, Cl, Br and I and x +y = 4 and the fluorocarbons (CF_xR_y where R is Br,Cl (or H) and x +y = 4).
- Simple bio-molecules that form the bases of DNA and RNA (adenine, cytosine, guanine, thymine and uracil) often called the *building blocks of life*.
- WATER, the universal solvent.

By the fall of 2005 most of the research aims have been met, indeed in several cases exceeded.

In the original Annex 1 the following milestones were declared

Year 1: Advertising/ recruitment of Younger Researchers. Establishment of Network WWW site.

(Month 1 -6) First Network meeting to determine specific project schedule and identify molecular targets to be studied by each partner laboratory.

(Month 7-12) Experimental research programme on halogenated hydrocarbons and fluorocarbons commenced.
Master class in 'Theory of Molecular dynamics and symmetry' organised by UCL
Master Class in Theoretical Modelling organised by ULRS.
Master class in surface preparation and UHV techniques organised by FUB and UPSO.

Year 2: Master class in preparation and synthesis of bio-molecules organised by UIBK.
Workshop on New Chemical synthesis using positrons (arranged in collaboration with International Positron workshop).

Second Network meeting to review progress on research programme (Mid -Term review).

Year 3. Third and concluding Network meeting. Publication of Network results through compilation of a series of review articles

The First Network meeting to determine specific project schedule and identify molecular targets to be studied by each partner laboratory was held at the coordinator's new institution in February 2002. The second Network meeting and mid term review was held at Obergurgl in Austria in June 2004 and the third Network meeting was held (jointly with the ESF EIPAM meeting) in Viterbo Rome in June 2005. A post EPIC meeting is planned at EIPAM 2 in Malta in September 2006.

The Master class in preparation and synthesis of bio-molecules was held in the UK arranged by OU in September 2003. The Master class in 'Theory of Molecular dynamics and symmetry' organised by and Master Class in Theoretical Modellingwas delayed due to late appointments of Younger researchers and was held in Prague in February 2005. A master class in surface preparation and UHV techniques has been held twice in December 2003 and December 2004 at the University of Liege with support from Alcatel vacuum Ltd.

1. Electron and positron induced reactions in the gaseous phase
Teams involved: OU, UCL, UIBK, FUB, ULRS, UAR, and ICP

Experimental Programme: The different fragmentation patterns induced by low energy electrons and positrons have been explored many halogenated hydrocarbons and fluorocarbons. The electronic state spectroscopy has been extensively investigated by OU and differential cross sections measured. Yields of both anionic and cationic fragments have been measured together with their kinetic energy by UIBK and FUB. Total electron scattering cross sections have likewise be measured at low energy (< 1eV) by UAR and such cross sections provide a complementary means of determining the probability of a specified molecule to undergo dissociative attachment. This work has attracted the interest of many groups worldwide involved in plasma etching. This has led to the development of strong links with the Japanese semiconductor plasma industry (see above).

The most dramatic progress in the network has been in the study of electron scattering from bio-molecules in particular the DNA bases adenine, cytosine, guanine, thymine and RNA base uracil and most recently the larger biomolecules including glycine, simple sugars and acids. UIBK and FUN have shown that dissociative electron attachment is a dominant process at low electron energies and is both bond (C-H versus C-N) and site selective (N1-H versus N3-H) in the DNA bases. These pioneering results suggest that may be possible to explore DNA damage at a basic molecular level. Indeed recent work by FUB, OU and UIBK has demonstrated a correlation between electron attachment rates to biomolecules and their carcinogenicity and may be used to suggest new compounds to be adopted in radiation therapy as treatment enhancing sensitizers, e.g. 5-bromouracil. Such pioneering research has led to an active and growing international research community, *one in which the EU is recognised as amongst the most active and leading members.*.

We have also started an extensive study of water with completion of a comprehensive review of current state of knowledge of electron interactions with water. This work is seen to be pivotal to future research radiation damage. Recent advances comprise of the assembling an authoritative data review of electron interactions with water(OU) and the conduct of detailed gas phase dissociatve electron attachment experiments to water (UIBK/OU). These experiments have been complemented by detailed theoretical calculations (UCL and ULRS) see below.

The research with positrons has developed rapidly in the last year. Detailed measurements of the total ionization cross-section by positron-impact on He have been performed from threshold up to 850eV by the UCL team. The positronium formation cross-section (QPs) for this target has thus been extracted. New results have also been obtained for QPs from CO_2 and H_2O. In the case of CO_2, the present QPs agrees well at high energies with previous determinations but the accord is poor on the position and magnitude of the peak. In the case of H_2O, the UCL have recorded the first QPs and shown that Ps formation in e+- H_2O collisions is non-negligible. In particular, at ~2eV above threshold, QPs has been found to be 6 times larger than a previous indirect estimate. However, it is noted that the Ps formation contribution to the total cross-section is significantly lower than in the case of the inert atoms.

The total cross-sections for positron and positronium scattering from H_2O molecules have also been measured for incident energies between 7-417eV and 10-100eV, respectively. The new data for both positrons and positronium display little energy dependence over the energy range investigated. The system has been characterized with respect to its angular acceptance both for positrons and positronium in order to correct the data for forward scattering effects once differential cross-sections become available.

First results have also been obtained for direct ionization cross-sections (both integrated and differential) of H_2O by positron impact. Fragmentation paths have also been identified.

Theoretical Programme: Methodology and general purpose codes, built upon existing codes constructed by teams in the network, have been developed to study fundamental electron interactions with halogenated hydrocarbons and fluorocarbons leading to excitation and dissociation. These have highlighted the different electron attachment processes to the CF_x radicals with CF supporting electron attachment but CF not, the consequences of which are dramatic for design of future industrial semiconductor plasmas. Recently the UCL group has developed their computational code to study larger molecular systems with first results on tetrahydrofuran being presented at the EPIC Network meeting. The UCL group has also reported the first results for electron induced dissociation of the water molecule. ULRS have performed the first calculations on complex biological molecules (glycine) pioneering new methods for probing radiation damage studies at the molecular level. In collaboration with ICP they have likewise developed methodology to study positron interactions with simple molecular targets, results that are now being tested by experiments performed at UCL.

Task 2. Reactions in clusters and aggregates
Teams: UCLE,ULCP,FUB,UIBK,UPSO
The goals of this research programme are to compare the electron induced reactions in the gas phase with those observed in simple cluster or aggregates and to determine the importance of intra-cluster scattering phenomena (electron transfer between the cluster components) in both primary and secondary chemical reactions. Some initial work in preparing clusters of halogenated hydrocarbons and fluorocarbons to study the role of such reactions as a function of cluster size and chemical composition have been performed by FUB some of which is in collaboration with OU. These studies have shown the dramatic changes to be found when electrons interact with event simplest dimmers. This work is now being extended to pioneering studies of electron attachment to bio-molecules and to targets consisting of a bio-molecule clustered either with water or simple organic molecules (acetic and formic acid dimmers). The ability to trap biomolecular clusters in He droplets has been demonstrated by UIBK and the possibility of forming Watson Crick pairs in mixed nucleoside base clusters is being explored. This experimental research has been complemented by theoretical calculations at ULRS.

Task 3. Reactions in the condensed phase

Teams: OU, UIBK, FUB, UPSO. Electron induced reactions from molecules absorbed upon surfaces have be studied both theoretically and experimentally. In this Network we have undertaken experimental studies on the formation and evolution of negative ion resonances in electron scattering from halogenated hydrocarbons and fluorocarbons absorbed on either metallic or ice surfaces. Dramatic changes in the dissociation pathways have been seen for molecules frozen on a surface compared to the gas phase. Such results suggest that with sufficient understanding it may be possible to perform selective bond breaking chemistry of surfaces using emerging STM technology, hence allowing truly nanoscale chemistry to be undertaken. A collaborative project between FUB and UPSO has demonstrated that electron reactions can also bind *specific functional groups* to a surface in a controlled way. In particular their demonstration that DEA of acetonitrile $CH_3CN + e^- \rightarrow CH_2CN^- + H$ can be used in the functionalization of hydrogenated diamond to attach organic groups to surfaces has great significance in the nanotechonology area where 'nanoscale lithography' may be induced by electron patterning.
This exciting prospect has led to the formation of an ESF 5 year Programme starting in 2004 in which.

- Theoretical modelling of these systems will be developed using a new R-matrix method to investigate how the environment influences the molecular inelastic scattering properties i.e. vibrational excitation, electronic excitation and dissociative attachment processes.
- Investigations for extending techniques developed for electron studies to using positrons to probe surfaces are also planned.
- The ability to utlize DEA in STM technology for single molecule engineering on a surface will be investigated.

Network training: A Master class in preparation and synthesis of bio-molecules planned for year 2 was organized by the co-coordinator as part of the new UK National Quantum, Atomic and molecular physics meeting in September 2003 and Master class in UHV techniques was held in December 2003 and was be repeated in December 2004. A theoretical methods workshop was held in Prague February 14 to 18 2005. This meeting was organized by the YRs themselves and will provide them with a unique opportunity to discuss the future development of theoretical modeling of electron/positron interactions with molecules. The meeting specifically precluded more senior staff since they may have preconceptions as to which methodology to follow. Two younger researchers from India and Brazil also attended the meeting (funded by non EPIC Funds).

Those young researchers in post by July 2003 presented their work at formal session of the Network meeting held in Prague on July 30, 2003. All Younger researchers employed by the Network presented their work at the mid-term review in at Obergurgl in June 2004 and at the EPIC/EIPAM meeting in Viterbo Italy, June 25 to 30 2005

In summary we have met and indeed exceeded the scientific and training milestones set for the network.

B4 Organisation and Management

Management Committee. A Management Committee was established at the initial Network Meeting held in the UK in February 2003. The management team is comprised of the leaders of each of the 8 partners and two co-opted members elected by the Network participants (Professor Tennyson from UCL and Professor A Zecca, ULRS). Professor N J Mason chaired the committee. Professor E Illenberger acted as Secretary with special responsibility for ensuring training of the younger members is reviewed. Minutes of the Committee meetings are recorded and are available for scrutiny by the Commission. Each partner nominated a member of their research group as *mentor* for the Young Researchers employed by them in the Network. At the annual meeting all younger researchers were interviewed by a mentor (from a different partner) and questioned as to

their progress and upon the training received, these comments were examined by the management committee and where appropriate action taken.

Research strand leaders. To maintain focus the research programme has been divided into three inter-linked scientific strands each reviewed by task leaders.
Task 1; Electron and positron induced reactions in the gaseous phase
Strand Leader: Experimental Professor D A Field (UAR)
Task 2. Reactions in clusters and aggregates
Strand leader; Professor T Märk, (UIBK)
Task 3. Reactions in the condensed phase
Strand Leader: Dr R Azria (UPSO)

Research teams working on each strand met at least once annually to discuss progress and plan future work. The meetings are chaired by the strand leader. As some strands obviously overlap, joint task meetings were organised as appropriate at the annual meeting. Between meetings informal contacts are maintained by email and through the Network electronic Newsletter (See below).

Annual Scientific Meetings. An annual scientific meeting was held. In July 2003 the first network meeting was held in Prague July 30 to August 1. The first day of the meeting was a closed meeting of the network at which the younger members of the network presented their work. The remainder of the Network meeting reviewed scientific progress in the three strands and held a general discussion allowing new results to be reviewed and new research avenues to be debated. Part of this meeting was held jointly with the Electron molecule and Swarms meeting allowing international colleagues to learn of the Network research programme. This was particularly useful as it has enabled the network to establish research links with US, Australian, Japanese, Indian and Brazilian research groups, making it a catalyst for international research in electron and positron induced chemistry. The second annual meeting which included the Mid-term review was held at Obergurgl, Austria from June 19th to 22nd June 2004. As well as reciving comments from the Commission representative (which were very supportive) the meeting reviewed the progress of the Network both in research and training. As indicated above progress in both areas has been impressive. External speakers at the meeting commented upon the success of the Network both as a research and co-ordination forum.

The third annual meeting was held jointly with the first ESF EIPAM (Electron Induced Processing At the Molecular level) Programme. All EPIC YRS then employed by the Network presented their research orally and in posters, the wider interests of the audience ensured a lively discussion! The standard of the presentations was uniformly high. Management team meetings were held at the conference.

Other network meetings were held in collaboration with the COST P9 ‘Radiation damage’ meeting in Lyons in June 24-27 2004 and Berlin 16-20 March 2005 (www.isa.au.dk/cost). EPIC members also participated in the International Miller conference on Radiation chemistry held in Nice in September http://web.cnrs-orleans.fr/~webcbm/miller/index.htm and the microdosimetry conference held in Venice in November http://micros05.lnl.infn.it/. The ESF Network Collisions in Atom Traps (CATS) – Durham UK March 2 - 30 2004 and the ESF Programme Electron Induced Processing of Atoms and Molecules (EIPAM) held as part of the 332th Wilhelm and Else Heraeus Seminar, "Processes Driven by Low Energy Electron-Molecule Interactions" 1st-4th September, 2004 at Bad Honnef, Germany. The network also had a major presence at the Eighth European Conference of Atomic and Molecular Physics (ECAMP) to be held in Rennes, France July 6-10, 2004 and for which N J Mason was the Chairman. EPIC members also participated in the 3rd Conference on the Elementary Processes in Atomic Systems (CEPAS 2005) 31st August-2nd

September 2005, Miskolc, Hungary and LEEMI IV - Negative Ions: Experiment and Theory 6th-9th October 2005, Castle Smolenice Slovakia.

Cohesion with Less Favoured Regions and Associate members
The Network has sought to make major interaction with the newly joined EU countries with the majority of the young researchers coming from new accession countries. This is to be expected since it is the students from those countries that would require the most training in the new techniques and skills. In addition one node (Prague) is based in Eastern Europe and sub node of Austria is based in Commenius University in Bratislava. We have in addition sought to acquire additional resources to allow members of these communities to attend Network meetings (e.g EPS and ESF funds) in the new Networks discussed above there are representations and partners from most of the Eastern European newly joined EU states. Active collaborations have been established with groups in Gdansk and Siedlce in Poland and Belgrade in Serbia. One former member of the OU group (Dr P Vieira) has recently been appointed Associate Professor in New university, Lisbon, Portugal and continues to collaborate with several partners (OU,FUB,UAR and UIBK) as well as Professor G Garcia, CSIC, Madrid who has become an affiliate of the OU group.

Connections with industry A major result of the Network has been to develop contacts with the Semiconductor industry in Japan (see discussion above). As a result a series of EU Japan initiatives is in preparation to perform joint research on semiconductor plasmas and nanolithography and a new RTN submitted to Framework VI on the role and exploitation of negative ions in industrial plasmas

B5 Training

5.1 Appointment of Younger researchers Research positions available under the Network were been widely advertised using electronic media, at conferences and by mail shots to major laboratories. The response was good but many of the applicants were not eligible for EU awards (being from non EU states such as the Former Soviet Union). Some candidates were still completing their PhD no Postdoctoral candidate was allowed to take up the post until they had definitively completed their PhD thesis. We therefore recruited a complete cohort of young researchers but due to the late receipt of the funds several posts were not filled until year 3. The grant was duly extended to December 31 2005 to allow completion of the training programmed.

The following table compares the current status of young researchers (Pre-Doc and Post-Doc) as of June 2002 with the plan in the contract.

Participant	***Contract deliverable of Young Researchers to be financed by the contract (person- months)***			***Young Researchers financed by the contract Sept 2005 (person-months)***		
	Pre-doc (a)	***Post-doc (b)***	***Total (alb)***	***Pre-doc (c)***	***Post-doc (d)***	***Total (cod)***
OU (UCLE)	0	36	36	0	36	36
UCL (UCLP)	0	24	24	27	16.5	43.5
UIBK	36	8	44	42	8	50
FUB	12	18	30	18	24	42
ULRS	0	36	36	8	25	33
UAR	0	24	24	0	24	24
IPC	38	6	44	32	12	44
UPSO	0	30	30	0	29	29
TOTAL	86	182	268	127	174.5	301.5

Notes on recruitment:

1. OU D Mary from Austria) was appointed from 1/7/2003 to 31/12/2004 to work on the experimental programmed at the OU. She married in 2004 changing her name to D Jaccs. Following completion of her EPIC post she was appointed a temporary lecturer and in December 2005 has gone on maternity leave. A theoretical postbox (Dr Simone Taioli) was appointed from 1/1/2004. This post was be shared with UCL as computational facilities are at UCL. The movement of the Co-coordinator from UCL to the OU in October 2002 has necessitated some organizational changes in training between UCL and OU not foreseen when Annex was drawn up since the Co-coordinator was at UCL.
2. UCL. Ms Cristiana Arcidiacono was appointed as a pre-doc 1/9/03 for 24 months and is now completing her thesis. Dr Zoran Pesic appointed post-doc 12/1/2004 16 months is now working as a research fellow at Institut des Nano Sciences de Paris, Campus Boucicaut.
3. UIBK. The Predoc Ms S Ptasinska was appointed from September 2002 and gained her thesis in November 2004, she was subsequently appointed to fulfill the eight month EPIC post at UIBK. Two predocs were appointed on short contracts Michael Steno 21.02.2005 to 20.10.2005 and Michael Cingl 01.10.2005 to 31.12.2005

4. FUB The Postdoc Dr Abdoul-Carime was appointed in January 2003 until October 2004 Mr Tibor Sadlacko was appointed as a predoc from 1/1/2005 to 30/06/2005.
5. ULRS. Dr. Jan Franz (Dec. 1st, 2004 to June 31, 2005) Dr. Franz is currently being employed by the University College Node of the same network to carry out similar research (low energy positron-molecule dynamics) Dr. Slawomir Telega visited in 2004 and from Jan 2005 – November 2005) after which he intends to continue his research in the group in Rome for another 9 months Dr. Kai Willner (May 2005 – November 2005)
   Dr. Willner intends to continue his research activities at the URLS Node and will be supported by another research grant. Dr. L. Gonzalez-Sanchez (May 2005 – Dec 2005)
   Dr. Gonzalez intends to continue her present research in the same group in Rome for another year and will be supported by another research grant.
6. UAR a Postdoc (Dr Nykola Jones) was in place from 1 September 2002 and was employed for the 24 months ending September 2004, she has now been appointed to a senior post as one facility researcher responsible for the synchrotron facility..
7. ICP appointed Peter Papp (4.11.2002 – 4.5.2003); Peter Hrušč (4.11.2002 – 4.5.2003) Vincent Brems (1.5.2004 -31.10. 2005) Michal Tarana (1.5.2004 -31.12. 2005)
8. UPSO 2 Predoctoral students were appointed in the first year each for 9 months, two new appointments were made in late 2003 and early 2004.The first postdoctoral post was filled in March 2003 for a 12 month period Dr D Caceres who returned for a second period in 2005. Dr D Pliska was then appointed as a postdoc for the remaining 12 months having worked in another node (URLS).

Integration of Young researchers; All the young researchers were provided with detailed description of aims and objectives of the EPIC network upon commencing their studies. Attendance at the network meetings is compulsory and all in post in July 2003 were required to give a presentation of their work by that date. All in post in June 2004 presented their work at the Midterm review and all in post in June 2005 presented their work at the EPIC/EIPAM Meeting Viterbo. Exchange of younger members between the research teams was strongly encouraged and has been enacted by most partners (see joint publications arising from these actions).

5.2 Training; A Master class in preparation and synthesis of bio-molecules planned for year 2 was organized by the coordinator as part of the new UK National Quantum, atomic and molecular physics meeting in September 2003 and Master classes in surface preparation and UHV techniques were held in December 2003 and 2004 while a workshop on 'Electron scattering theory' was held in Prague in February 2005. In each partner laboratory the young researchers have been encouraged to make use of the institute's own training programmers for young researchers. These include career instruction, project management and timekeeping courses. In addition several have made use of specialized language courses to allow them to integrate with the country in which they are undertaking training.

Equal opportunities: 5 of the younger researchers employed under the network were women and have been advised of specialize training courses at their host institutions.

Interdisciplinary Aspects: The nature of the network makes the training necessarily interdisciplinary with aspects of physics, chemistry and biology being employed in the research studies as well as some aspects of technology and computer science and IT.

Factual information on the Young researchers employed on the Network

Host; Open University; United Kingdom

Dr D Mayr/Jaksch: Nationality Austrian; Start date July 2003 End Date December 2004; Employment as Post-doc; Previous contact PhD University of Innsbruck. In 2004 Dr Mayr married and thence became r D Jaksch.

Host; Open University; United Kingdom and University College London

Dr Simone Taoli Nationality Italian; Start date January 2004 End Date July 2005; Employment as Post-doc; NO Previous contact with nodes

Host; University College London

Ms Cristiana Arcidiacono Nationality Italian; Start date September 2003 End Date December 2005; Employment as Pre-doc; NO Previous contact with nodes. In 2005 Ms Cristiana Arcidiacono gave the following presentations: "Triply differntial ionization cross-sections by positron impact" at the National Workshop on Positron Physics in June 2005 in Belfast, UK; "Positron impact ionization of Water"at EPIC meeting in June 2005 in Viterbo, Italy; "Differential Ionization Studies by Positron Impact" at the international meeting on Low Energy Positron and Positronium Physics in July 2005 in Campinas, Brazil; "Differential Ionization Studies by Positron Impact" at CEPAS in 2005 in Miskolc, Hungary. Cristiana Arcidiacono's poster entitled "Positron impact ionization of Water" won the prize for best poster at LEPPP 2005 in Campinas, Brazil. She is currently writing a number of papers and her PhD thesis.

Dr Zoran Pesic Nationality Serbian; Start date January 2004 End Date May 2005; Employment as Post-doc; NO Previous contact with nodes. Dr Zoran Pesic is now a research fellow at Institut des Nano Sciences de Paris, Campus Boucicaut, 75015 Paris, France.

Host; Free University Berlin

Dr Hassan Abdoul-Carime Nationality French; Start date November 2003 End Date August/September 2005; Employment as Post-doc; NO Previous contact with nodes.

Mr Tibor Sedlacko Nationality Polish; Start January 2005 end June 2005 Employment as predoc. NO Previous contact with nodes

Host; University of Innsbruck

Ms Sylwia Ptasinska Nationality Polish; Start date January 2003 End Date September 2005; Employment as Pre-doc; NO Previous contact with nodes.

Mr M Stano Nationality Slovak; Start date February 2005 End Date October 2005; Employment as Pre-doc; NO Previous contact with nodes.

Mr M Cingl Nationality Slovak; Start date October 2005 End Date December 2005; Employment as Pre-doc; NO Previous contact with nodes.

Host; University of Rome

Dr S.Telega Nationality Polish; Start date August 2003 End Date October 2003; returning in 2005 January to November Employment as Post-doc; NO Previous contact with nodes

Dr Damian Pliszka Nationality Polish; Start date December 2003 End Date December 2004; Employment as Post-doc; NO Previous contact with nodes Then moved to UPSO for a further year.

Dr Jan Franz Nationality German; Start date December 2004 End Date June 2005; Employment as Post-doc; NO Previous contact with nodes.

Dr Kai Willner Nationality German; Start date May 2005 End Date November 2005; Employment as Post-doc; NO Previous contact with nodes.

Dr L Gonzalez-Sanchez Nationality Spanish; Start date May 2005 End Date December 2005; Employment as Post-doc; NO Previous contact with nodes.

Host; University of Aarhus

Dr Nykola Jones Nationality British; Start date September 2002 End Date August 2004; Employment as Post-doc; Previous contact with nodes PhD student UCL.

Host; ICP Prague

Peter Papp Nationality Start date November 2002 End Date May 2003; Employment as Post-doc; NO Previous contact with nodes

Peter Hrušč Nationality Slovakian Start date November 2002 End Date May 2003; Employment as Post-doc; NO Previous contact with nodes

Dr Vincent Brems Nationality German Start date May 2004 End Date December 2005; Employment as Post-doc; NO Previous contact with nodes

Michal Tarana Nationality Slovak Start date May 2005 End Date December 2005 employed as predoc in 2005 NO Previous contact with nodes

Host: University of Paris-Sud:

Dr Daniel Caceres Nationality Spanish; Start date March 2003 End Date March 2004; Returned for further six months in 2005 Employment as Post-doc; No Previous contact with nodes. In 2005 he was appointed a lecturer at University Carlos III in Madrid

Dr Damian Pliszka Nationality Polish; Appointed 1 February 2005 til Decmeber 31 2005. He was previously at Trento Italy as an EPIC grant.