

NATO ADVANCED STUDY INSTITUTE

No. ASI 970487

**DESIGN AND CONTROL OF STRUCTURE OF ADVANCED CARBON MATERIALS FOR
ENHANCED PERFORMANCE**

ANTALYA TURKEY MAY, 1998

Objective

The overall objective is to provide 'state of the art' understanding of all forms of carbon materials from fullerenes to graphite (including activated carbons, fibres and composites) terms of the structure of the materials, how this controls engineering properties and how this structure itself can be controlled now and potentially in the future by understanding and control of the processing parameters. The materials will be viewed as a spectrum varying crystallographic structure and texture on the nano- and micro-scales of size.

Director

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Administration

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Organising Committee

Prof B. Rand Dr. F. Yardim

University Of Leeds, UK.

Prof. D.D. Edie Dr. P. Ehrburger Dr R. Wolf

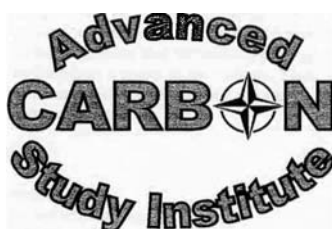
Istanbul Technical University, Turkey
Clemson University, USA
CNRS, Mulhouse, France
Schunk Kohlenstofftechnik GmbH, Germany

Lecturers

Dr. X. Bourrat
Dr. T. Burchell
Dr. P Delhaes
Dr. F. Derbyshire
Prof. M. Endo
Dr. M. Heggie
Prof. J.P. Issi
Prof. G. Lavin
Prof B. McEnaney
Prof. E. Yasuda

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University of Kentucky, USA
Shinshu University, Japan
University of Sussex, UK
Université Catholique de Louvain, Belgium
Du Pont Central Research & Development,
USA
University of Bath, UK
Tokyo Institute of Technology, Japan.

PROGRAMME



Day 1, Sunday 10 May

08.30- lunch	Registration	
	Theme and introduction:	B.Rand
	Polymorphism in carbons:	P.Delhaes
	Theory and modelling of carbon:	M.Heggie
19.30 - 22.00	Characterisation of carbon structure: Poster Session A and Discussion Groups	X.Bourrat

Day 2, Monday 11 May

08.30 – lunch	Microporosity and its characterisation:	B. McEnaney
	Structure and chemistry of carbon surfaces I:	
19.30-22.00	Structure and chemistry of carbon surfaces II: Poster Session B and Discussion Groups	

Day 3, Tuesday 12 May

08.30 – lunch	Oxidation in graphite: Thermal and electrical properties	M. Heggie
	- relationship to structure: Carbon alloys:	J.P.Issi.
	Carbon alloys:	E.Yasuda
19.30-22.00	Carbon in environmental applications: Poster Session C and Discussion Groups	F. Derbyshire

Day 4, Wednesday 13 May

08.30 – lunch	Carbon materials for energy production and storage: Porous carbons for gas separation and storage: activated carbons	T.Burchell
	- alternative and emerging technologies:	B. McEnaney
	Mechanical and electrical carbons	F. Derbyshire
	- defining and meeting the need	
19.30-22.00	Poster Session D and Discussion Groups	R.Wolf

Day 5, Thursday 14 May

08.30 – lunch	Low density carbon and carbon/ceramics: Mechanical properties of C/C composites:	B. McEnaney
	Carbon – ceramic: alloys and parent materials:	E. Yasuda
	Carbon – ceramic alloys:	P. Delhaes
19.30-22.00	Poster Session E and Discussion Groups	B. Rand

Day 6, Friday 15 May

08.30 – lunch	Pitch precursors - origin and chemical constitution:	M.F.Yardim & E. Ekinci
	Physical properties and thermal processing of pitch and mesophase pitch:	B.Rand
	Physico-chemical properties of pitch	P. Ehrburger
19.30-22.00	Mesophase precursors for advanced carbon fibres: Plenary Discussion	G. Lavin & D.D.Edie

Day 7, Saturday 16 May

08.30 – lunch	The effect of processing on the structure and properties of carbon fibres I:	D.D.Edie
	The effect of processing on the structure and properties of carbon fibres TL:	D.D.Edie B.Rand & S.P. Appleyard
19.30-22.00	Processing / structure relationships in C/Composites Interface in ceramic and carbon matrix composites: Poster session Poster Session F and Discussion Groups	X. Bourrat

Day 8, Sunday 17 May

Rest day

**Day 9, Monday
18 May**

08.30 – lunch	Production of nanotubes and vapour grown carbon fibres Single wall nanotubes and other carbon nanoparticles:	M.Endo G. Lavin
19.30-22.00	Physical properties of nanotubes and filaments: Carbon materials for Li-ion batteries and super-capacitors: Poster Session G and Discussion Groups	J.P.Issi M.Endo

Day 10, Tuesday 19 May

08.30 – lunch	Manufacture of bulk carbon and graphite-materials: Graphite fracture I: behaviour and models:	T.Burchell T.Burchell
19.00-22.00	Graphite fracture II: the role of porosity: Processing of carbon materials for high thermal conductivity: Plenary Discussions	D.D.Edie

Day 11, Wednesday 20 May

09.00 –lunch	“Sintered” carbon – production and applications:	B.Rand and R.Wolf Concluding
	Discussions on Design and control of structure covering: i) Industrial “pull” ii) Structural design iii) Processing directions iv) Scientific requirements for future exploitation	
19.30	Final dinner	

POSTER SESSION A

Jose V. Anguita

School of Electronic Engineering University of Surrey Surrey GU2 5XH, UK
FTIR spectroscopy analysis of doped and annealed hydrogenated amorphous carbon films

Adrian P. Burden

School of Electronic Engineering University of Surrey Surrey GU2 5XH, UK
From films to fullerenes - PECVD generated carbon and its analysis deposition from an electronic engineering perspective.

Nicolay Gall

A.F.Ioffe Physico-Technical Inst.
Deposition cell of carbon atoms containing no carbon clusters

Nina Kovtyukhova

Institute of Surface Chemistry,
National Academy of Sciences of Ukraine, 31, Pr.Nauky,
252022 Kiev, Ukraine E-mail: nik@surfchem.freenet.kiev.ua

(i) Self-assembly of composite graphite oxide/polymer ultrathin film on Si and Al₂O₃/Al substrates

Nina Kovtyukhova

Institute of Surface Chemistry,
National Academy of Sciences of Ukraine, 31, Pr.Nauky,
252022 Kiev, Ukraine surface determine the quality of the first inorganic layer and the multilayer film. E-mail: nik@surfchem.freenet.kiev.ua

(ii) Production of carbon-metal and graphite-metal composites from oxidized graphites Oxidized graphites, due to their layered structure and high content of oxygen-containing

Nina Kovtyukhova

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National Academy of Sciences of Ukraine, 31, Pr.Nauky,
252022 Kiev, Ukraine stability in water and organic solvents. E-mail: nik@surfchem.freenet.kiev.ua

Istvan Pocsik

Research Institute for Solid State Physics, H-1525 Budapest, P.O.Box 49, Hungary
Origin of the D-Peak in the Raman Spectrum of Microcrystalline Graphite

Cesar Merino Sanchez

Materials Dept., Fachhochschule Gelsenkirchen, University of Applied Science, Germany.
Duplex structure of carbon fibres grown from a gaseous stage on a substrate crystalline perfection than the outer phase.

John L. Shultz

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ENRC/HiDEC, 600 W 20th St E-mail: jshultz@comp.uark.edu
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Comparison of infrared, Raman, photoluminescence, and x-ray photoelectron spectroscopy for characterizing arc-jet-deposited diamond films

POSTER SESSION B

Giuseppe Egidio De Benedetto E-mail: debenedetto@unibas.it
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Effect of pretreatment of carbon materials on the direct electrochemistry of horse radish peroxidase for the production of a biosensor

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Modification of surface chemistry of active carbons: Creation of basic carbon surfaces in order to obtain activated carbons with low oxygen content, highly hydrophobic and with basic

Chris Hindmarsh
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The interaction of bromine with carbon materials

Sergei N. Mazaev
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Metallostroy,
189631, StPetersburg, Russia
Atomic Hydrogen Interaction with Various Graphite Types

Boris Odintsov
Illinois EPR Research Center University of Illinois Urbana, USA
Carbon-Based Sensors for In Vivo Magnetic Resonance Oximetry thermal treatment procedure. Unexpected and fundamentally new intermolecular hyperfine

Elzbieta Pamula
Université Catholique de Louvain
Laboratory of Chemistry of Interfaces E-mail: pamula@cifa.ucl.ac.be
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1348 Louvain-la-Neuve, Belgium
The influence of sterilisation methods on mechanical and physico-chemical properties of fibrous carbon implants the surface. The thermal methods: steam sterilisation and dry heat, did not affect the properties

Manuel Fernand Ribeiro Pereira
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Department of Chemical Engineering at University of Porto
- Porto, Portugal.
Modification of the surface chemistry of activated carbons

Alexander Puziy

Institute for Sorption and Problems
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Ukraine

Surface acidity of synthetic carbons activated with phosphoric acid

POSTER SESSION C

Jurgis Barkauskas

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Effect of preparation conditions on the texture of activated carbons domains seen in micrographs is conducted

Gregorio Marban Calzon

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Modelling the gasification of carbon fibres

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Metallization of carbon fibres for microelectrode manufacturing

Leonid Golovko

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Chemical modifying of carbon surface

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Carbon foil used as substrate for conducting polymer deposition

POSTER SESSION D

Rodney Andrews

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Effect of heat treatment conditions on activity of activated carbon fibers for SO₂ removal

Joerg Arndt

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Fabrication of High-Strength Carbon material for Pistons in Spark Ignition (SI) Engines

Konstantinos Beltsios

Georgios L Pilatos
Inst, of Physical Chemistry, NCSR "DEMOKRITOS", Aghia Paraskevi Attikis, GR-153 10
Greece

Structure control and gas separation properties of asymmetric carbon membranes from thermos* polymeric precursors

James Klett

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Oak Ridge, TN, 37931-6087 USA

High Thermal Conductivity Pitch-based Carbon Foam for Thermal Management Applications

Dolores Lozano-Castello

& Jorge M. Garcia Cortes
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Departamento de Química E-Mail: jorge.gc@ua.es
Inorganica
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Methane enrichment from byogas

Gema de la Puente

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Influence of activated carbons surface chemistry on their performance as catalyst supports

Henly Park
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The production and properties of structured phenolic resin carbons

Anthony J. Wickham

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Materials issues related to the treatment and disposal of graphite from fission reactors

POSTER SESSION E**Ana-Maria Bondar**

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Composite carbon materials used as electromagnetic radiation absorbents

PetrGlogar

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Dynamic elastic properties of C/C composites studied by the resonant frequency technique

Marcos Granda

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Institute Nacional del Carbon,
CSIC, Oviedo Spain

Research on carbon materials at the National Institute of Coal in Spain (Group of Composite)

Iulian Iordache

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ShilinLu

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Thermal stability of novel carbon-silicon alloy fibres

Ion Pencea

Faculty of Science and Engineering of Materials University Politehnica Bucharest Bucharest,
ROMANIA

The correlation between structure and heat treatment temperatures applied to the metallurgical carb electrodes and PAN base carbon fibers.

Natalia N. Rozhkova E-mail: rozhkova@post.krc.karelia.ru

Laboratory of Shungites, Institute of
Geology, Karelian Research Center,;
Academy of Science, Petrozavodsk
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Shungite influence on rubber properties

Aidan Westwood

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Leeds, Leeds LS2 9JT, UK
Oxidation resistant carbon-ceramic alloys and fa=

POSTER SESSION F**Emmanuelle Alain**

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Influence of different additives on mesophase formation and development

Anthony D. Cato

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Flow and structural development during melt spinning of mesophase pitch

Jafar Daji

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Rheological Characterisation of Pitch Based Precursors

Bahrain Fathollahi E-mail: bfatholl@ames.ucsd.edu

University of California San Diego, USA
Nanotubular microstructures in mesophase carbon fibers

Nicole Grobert

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Environmental Science
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England, U.K.

C60 Yields Ni-filled Sharp Nanotubes

Highly graphitised elongated carbon nanostructures with Ni encap-sulated (needle-like)

Milo Shaffer

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Metallurgy, University of E-mail: mspsoo@cam.ac.uk
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Carbon nanotube dispersions

Mahomed Hanif Ussman

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Structure and the mechanical deformation of fibres

POSTER SESSION G**Ana M. Benito**

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Production of Bundles of Single-Walled Nanotubes by Laser-Ablation Technique

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Philip G. Collins

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Applied physics of carbon nanotubes

Wolfgang Maser

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Comparative study on single-walled nanotube material obtained by different production techniques

Hong Huang

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Delft, The Netherlands

Studies on Lithium Intercalation Performance of Dynamic Compacted Graphite

Ian Mellor

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Loughborough University, Loughborough, LE11 3TU, UK.

A novel battery energy storage system based on carbon nanofibres

Stuart J. Rowen

Carbon Research Group, Dept Of E-mail: S.J.Rowen@lboro.ac.uk Chemical Engineering,
Loughborough University, Loughborough, LE11 3TU, UK.

Carbonaceous materials for bipolar plates in fuel cells

Mauricio Terrones

School of Chemistry, Physics and Environmental Science University of Sussex Brighton, BN1
9QJ, U.K.

Novel routes to nanotubes and nanowires