BIOMATERIALS
&
INTELLIGENT MATERIALS

Technological Aspects & Medical Applications

An International Meeting Organized by C.N.R.S.M. & C.N.R.
Residence "PLAIA A MARE"
Villanova di Ostuni
Brindisi - Italy

September 21 - 26, 1992

SYLLABUS & FINAL PROGRAM

Outline of C.N.R.S.M.
Structure of the Meeting
Abstracts of Tutorial, Scientific & Poster Sessions

Scientific Publishing Division of C.N.R.S.M.
BIOMATERIALS : Series I, n. 1

Biomaterials
&
Intelligent Materials:
Technological Aspects & Medical Applications

September 21 - 26, 1992 - Villanova di Ostuni - Italy

Organized by
C.N.R.S.M. & C.N.R.
Project "Advanced Materials for New Technologies"

Auspices of
MURST, INFM, GNSM-CNR, ASI, ENEA, ENEL, ESB, SIB
University of Lecce, University of Padua, University of Pisa,
University of Naples, Politechnic of Bari University, University of Rome II
Clinical Physiology Institute of C.N.R. in Pisa

Sponsored by
BIOMATERIALI - BRUKER SPECTROSCAN - CNR - ENEA - ENEL - ESAOTE
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Paolo CAVALIERE and Claudio BATTISTONI

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Paolo GIUSTI, Danilo DE ROSSI, Franco GIANNINI,
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Organizing Secretariat:
M. Grazia RESTA, Patrizia AVERSA, Antonella CARAMIA, Antonio CATALANO,
Angelo FRAGNELLI, M. Concetta MARTUCCI, , Valerio MICELI,
Mario PRATO, Paolo ROTOLO and Pino OLIVE
C.N.R.S.M.: Cittadella della Ricerca - S..S. 7, Km 7, 72100 BRINDISI - Italy
Telephones 39-831-327591- 588010-588012 Fax numbers 39-831-327594-588014

Few tips on C.N.R.S.M.

C.N.R.S.M. is a new laboratory for applied research and advanced technological services. It is 8.000 sqm large, within a Scientific Park of 210.000 sqm. It is functionally structured in 6 *Areas of Interest* * and is located close to Brindisi, once the Italian gate to Orient. It is meant to serve as a reference point, linking the already existing national and international research centers which operate in the field of innovative materials.
The center is equipped with state-of-the-art instruments such as MOCVD, reactors for plasma, ion implanter, TANDEM, electron accelerator, ESCA, AUGER, SIMS, high resolution microscopes with analytical capacity, acoustic microscopy, chemical and diffractometric techniques, apparatus for mechanical testing and thermoanalysis, optic spectrometers, parametric analysis system, climatized cells, apparatus for tribological characterization, NMR spectrometry, apparatuses for production and testing of biomaterials in vitro.

Main goals of C.N.R.S.M. - which is well embedded into Scientific Park - are:
a) to contribute actively to the development of Southern Italy by creating an international research center in the field of Science and Technology of Materials;
b) to train a *critical mass* of highly qualified Scientists and Technologists capable to introduce advanced technology in economically and scientific strategic fields;
c) to address efforts to study and develop new materials for advanced applications as well as to improve processes and new technology for analysis, preparation, diagnosis and characterization methods, and testing of materials, as these are rarely available at national and, sometimes, international level;
d) to meet the present needs in the areas of material production and analysis, product quality control and applied research in the field of Science and of Technology of Materials;
e) to cooperate with public sectors (universities, schools, regional administration) in the training of technical staff (graduates and diplomas holders) to be qualified in the field of Materials and of Innovative Technologies;
f) to produce and promote new technology through the action of structures and infrastructures such as data banks, information gathering centres, continuous education and practical courses.

**** AREAS of INTEREST and FUNCTIONAL DIVISIONS of C.N.R.S.M.***

I *PREPARATION of MATERIALS*

II *TREATMENT & ANALYSIS of SURFACES*

III *MICROSTRUCTURAL & MICROANALYTIC CHARACTERIZATION*

IV *MACROSCOPIC CHARACTERIZATION*

V *BIOMATERIALS*

VI *GENERAL SERVICES for RESEARCH and ADMINISTRATION*

List of
INDUSTRIES, CENTERS, INSTITUTIONS and UNIVERSITIES
present in the
SCIENTIFIC PARK of Brindisi

AGEMINA - AMM.NE PROV.LE BR - AUGUSTA
BIOMATERIALI - C.N.R.S.M. - COLLEG. NOTAR.LE BR
EDILSTAMPA - ENEA - ERICSSON FATME - ESAOTE - FIDIA
FINPUGLIA - FORMIT - GEI INFORM - ICIE - INTERNOVA
ISPREDIL - ITALCEMENTI - IBM SEMEA
KONTRON - OPTEL - PHILIPS - SEIPI
SLIA - SNIA - T.F. - TRUSSARDI
UNIVERSITA' di LECCE
UNIVERSITA' di ROMA II

Institutions Cooperating on Scientific Programs with C.N.R.S.M.

Accademia delle Scienze di Russia - Università di Antwerp
Università di Heidelberg - Università di Marsiglia
Università di Padova - Università di Pisa -Università di Surrey
AARHUS -AEROSPATIALE - ALENIA - BAM Berlin
BRITISH AEROSPACE - CNNC China - CNR LAMEL
DLR-Stuttgart - MAX PLANCK Inst. Stuttgart
MERCEDES BENZ - TEMAV

SPECIFIC INFORMATION ON THE MEETING

Site of the Meeting and Information during the Meeting September 21-26, 1992

HOTEL RESIDENCE 'PLAIA a MARE' - Lido Fontanelle
VILLANOVA di OSTUNI (Brindisi) - Phone: 39-831-97064 Fax: 39-831- 338302

How to get there: Please, let us know if we can be of some help (i.e. pick you up) !!!

- By Airplane: to Brindisi or to Bari airport
- By Train: to Brindisi or to Ostuni FF.SS. station
- By Coach: to Brindisi or to Ostuni Coach station
- By Car: highway up to Bari, then superstrada "Litoranea" to Villanova di Ostuni

Site of C.N.R.S.M. and Information on the Meeting before September 20, 1992

Cittadella della Ricerca (Scientific Park of Brindisi)
S.S. n. 7, (Km 7 from Brindisi, 5 Km from Mesagne)
Phones 39-831-588010 - 588012 - 327591 Fax numbers 39-831-588014 - 327594
E-MAIL INNOMAT@CNRSM .IT

Tuiton Fee:	Before SEPTEMBER 10, '92	After SEPTEMBER 10, '92
- Tutorials only:	600.000 Lit	750.000 Lit
- Scientific Sessions only:	300.000 Lit	350.000 Lit
- Both Tutorials & Scientific Sessions:	800.000 Lit	950.000 Lit
- Reduction for Students	500.000 Lit	600.000 Lit.

Admission includes:

Attendance, syllabus of abstracts outline of tutorial, scientific and poster sessions, coffee, tea breaks, lunch buffets, social dinner and simultaneous translation.

Payment:

c/c Comitato Organizzatore "Materiali Innovativi" n°19750/0-96
Banca del SALENTO, Via B. Normanno, 72023 Mesagne (BR)

Cancellation Conditions:

No payment can be refunded against cancellation if notice is received after September 10, 1992. Cancellation prior to that date will be subject to a 20% charge. Sorry!

Hotel Accomodation:

Please, contact directly HOTEL PLAIA a MARE (see above phone and fax numbers) or refer to Organization Secretariat at C.N.R.S.M. for any possible help.

Accompanying Persons:

Special tours will be available for visiting and enjoying artistic as well as natural resorts in the area of Ostuni and around the following cities: Bari, Brindisi, Foggia, Lecce and Taranto.

Official Language:

Italian-English-Italian with simultaneous translation.

Certificate of Attendance:

Regularly registred Partecipants will receive a certificate of attendance.

Late or Last-moment Registrations:

Registration will also take place starting at 8 a. m. on Monday 21, at meeting site.

List of Topics

Glasses, Carbon and Metals - Ceramics - Composite Materials
Synthetic and Naturally Occurring Polymers
Stimulus Responsive Material - Structural, Physical and Chemical Characterization of Biomaterials
Methods to Characterize Biocompatibility of Biomaterials
Tossicology and Mutagenecity of Biomaterials - Biosensors
Langmuir Blodgett Systems - Systems for Controlled Release
Biomaterials for Hard Tissue Applications
Biomaterials for Soft Tissue and Cardiovascular Devices
Implantable Prostheses - Artificial organs

List
Scientific Advisory Board, Tutorial and Scientific

L. AMBROSIO, Napoli - T. AVRAMOGLOU, Villetaneuse - R.BARBUCCI, Siena
M. BELATI, Roma - L. BENEDETTI, Abano Terme - C. BOISSON-VIDAL, Villetaneuse
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P. SPEZIALE, Pavia - M. C. TANZI, Milano - L. TAPFER, Brindisi - T. TATEISHI, Tsukuba
E. J. M. A. THONAR, Chicago - P. TRANQUILLI-LEALI , Roma - F. VALLANA, Saluggia
L. VALLI, Lecce - E.M. J. VAN DOREN, Antwerp - E. VAN OCKEN, Antwerp
L. VASANELLI, Lecce - P. VERSURA, Bologna - N. VOLPI, Modena
D. F. WILLIAMS, Liverpool - I. V. YANNAS, Cambridge

STRUCTURE of the MEETING: September, 21 - 26, 1992

TUTORIAL SESSIONS (21 - 24) : These sessions are addressed to those interested in a systematic approach to the field of materials, of structures and of innovative technological devices in medicine. In particular, physicians, biologists, engineers, physicists, chemists, pharmacists, technicians, students, industrial and university researchers as well as students of related fields will benefit from such tutorials to understand the scientific aspects and the applications of biomaterials. There will be lectures and some practical demonstrations on materials, devices and instrumentation. A number of scientific tutors will be also available for assisting partecipants during the meeting.
The total number of tutorial lectures will be 50.

SCIENTIFIC SESSIONS (25 - 26) : State-of-the-art lectures, controversies and perspectives of biomaterials and intelligent materials will be illustrated, with an multidisciplinary approach, by prominent scientists with the aim: a) to help junior investigators to explore and select clues for specific research programs; b) to enhance exchange of experiences between researchers; c) to highlight future directions in scientific activity on biomaterials and intelligent materials.
The total number of scientific lectures will be 21.

POSTER SESSIONS (25 - 26): These sessions will give the opportunity to researchers to submit their own work or to illustrate scientific activities undergoing in their institutions. Accepted poster will be displayed and discussed - on September 26 - with the coordination of a moderator.
The total number of accepted posters is 50.

TECHNICAL EXHIBITION (21 - 26): Scientific institutions and industries will show - by the contributions of experts and technicians - devices, materials and video clips inherent to the subjects of the meeting. A selection of books and educational material will be also available at the exhibition site

OPENING SESSION: 21 September 1992

15.00 Welcome

15.30 BIOMATERIALS: CHALLENGES for the 2000
Paolo GIUSTI (Pisa - Italy)

16.00 "INTELLIGENT POLYMERS in MEDICINE and in BIOTECHNOLOGY"
Allan S. HOFFMAN (Seattle - U.S.A.)

16.30 ENGINEERING, BIOENGINEERING and MEDICAL DEVICES
Marcello BRACALE (Napoli - Italy)

Tutorial Sessions 22 September ,1992

Session I BIOMATERIALS : BASICS and PERSPECTIVES

Chairmen: E.J.M.A. THONAR (Chicago) - R. d' AGOSTINO (Bari)

9.00 From BIOCHEMISTRY to BIOMATERIALS
Giovanni RONCA (Pisa - Italy)

9.30 PHYSIOPATHOLOGY of FOREIGN BODY INFECTIONS
Daniel LEW (Ginevra - Suisse)

10.00 SKELETAL MECHANICS
Arturo NATALI (Padova - Italy)

10.30 ARTIFICIAL DEVICES for CARDIOVASCULAR FUNCTIONS
Bruno MAMBRITO (Pomezia - Italy)

11.00 - 11.30 COFFEE BREAK

Session II BIOMATERIALS : INTERACTION PROTEINS-CELLS

Chairmen : D. LEW (Ginevra) - L. MINOLI (Pavia)

11.30 POLYMERS-PROTEINS and CELLS INTERACTIONS
Catherine BOISSON-VIDAL (Villetaneuse - France)

12.00 PROTEIN-POLYSACCHARIDE INTERACTIONS
Nicola VOLPI (Modena - Italy)

12.30 INTERACTIONS between MONO-DI- and POLYCARBOXILIC ACIDS with MYOSIN ATP ase
Lorenzo BOLOGNANI (Modena - Italy)

13.00 CYTOGENETIC METHODS in BIOCOMPATIBILITY FIELD
Mario CANNAS (Torino - Italy)

13.30 - 15.00 LUNCH and TECHNICAL EXHIBITION

Session III NATURAL and ARTIFICIAL POLYMERS'

Chairmen: C. ROGERS (Blacksburg) - C. MIGLIARESI (Trento)

15.00 BIODEGRADABLE MATERIALS for ORTHOPAEDIC SURGERY
Paolo TRANQUILLI-LEALI (Roma - Italy)

15.30 CURRENT CONCEPTS IN THE FIELD OF ARTICULAR CARTILAGE BIOCHEMISTRY
Eugene J.M.A. THONAR (Chicago - U.S.A.)

16.00 HEPARIN-LIKE POLYMERS
Catherine BOISSON-VIDAL (Villetaneuse - France)

16.30 DIFFERENT ACTION of BIOSPECIFIC POLYMERS on CELL PROLIFERATION CELL ADHESION and REGULATION of CELL RECEPTOR EXPRESSION
Thierry AVRAMOGLOU (Villetaneuse - France)

17.00 - 17.30 COFFEE BREAK

Session IV NEW MATERIALS

Chairmen : R. BARBUCCI (Siena) - D. DE ROSSI (Pisa)

17.30 NATURAL COMPOSITES from RENEWABLE RESOURCES
Maurizio AVELLA (Napoli - Italy)

18.00 BIODEGRADABLE POLYMERS: SYNTHESIS, PROPERTIES, APPLICATIONS
Claudio MIGLIARESI (Trento - Italy)

18.30 BIOCOMPATIBILITY of NEW MATERIALS
Gianfranco PELUSO (Napoli - Italy)

19.00 - 20.00 TECHNICAL EXHIBITION and PRACTICAL DEMONSTRATIONS

Tutorial Sessions 23 September 1992

Session V PHYSICO-CHEMICAL and MECHANICAL CHARACTERIZATION of BIOMATERIALS

Chairmen: V.E.M.J. VAN DOREN (Antwerp) - L. VASANELLI (Lecce)

9.00 STRUCTURAL, PHYSICAL and CHEMICAL CHARACTERIZATION of BIOMATERIALS
Paolo MAZZOLDI (Padova - Italy)

9.30 ELASTOMECHANICS of HYDROGELS
Piero CHIARELLI (Pisa - Italy)

10.00 SOME ROUTINE TECHNIQUES for the CHARACTERIZATION of LB FILMS
Ludovico VALLI Lecce - Italy)

10.30 MECHANICAL CHARACTERIZATIONS of BIOMATERIALS
Andrea LAZZERI (Pisa - Italy)

11.00 - 11.30 COFFEE BREAK

Session VI SURFACES

Chairmen: T. TATEISHI (Tsukuba) - P. MAZZOLDI (Padova)

11.30 SURFACE MODIFICATION by : CHEMICAL PROCEDURE; TREATMENT with an ENERGY SOURCE; IMMOBILIZATION of BIOLOGICAL MOLECULES.
Rolando BARBUCCI (Siena - Italy)

12.00 SURFACE CHARACTERIZATION OF BIOMEDICAL POLYURETHANES
Buddy RATNER (Seattle - U.S.A.)

12.30 SURFACE MODIFICATION by LOW-PRESSURE PLASMA TECHNIQUES for BIO-MEDICAL APPLICATIONS
Pietro FAVIA (Bari - Italy)

13.00 SURFACE CHARACTERIZATION : ATR / FT-IR ANALYSIS and ADSORPTION of PROTEINS on BIOMATERIALS
Agnese MAGNANI (Siena - Italy)

13.30 - 15.00 LUNCH and TECHNICAL EXHIBITION

Session VII APPLICATIONS of BIOMATERIALS (I)

Chairmen : B. RATNER (Seattle) - A. CIGADA (Milano)

15.00 BIOMATERIALS for HARD TISSUE APPLICATION: ACTIVE GLASSES, METALS & CERAMICS
Antonietta Morena GATTI (Modena - Italy)

15.30 HYALURONIC ACID and its DERIVATIVES for BIOMEDICAL APPLICATION
Luca BENEDETTI (Abano Terme - Italy)

16.00 CARBON-COATED IMPLANTS
Franco VALLANA (Saluggia - Italy)

16.30 - 17.00 COFFEE BREAK andTECHNICAL EXHIBITION

Session VIII APPLICATIONS of BIOMATERIALS (II)

Chairmen : T. MATSUDA (Osaka) - A. M. GATTI (Modena)

17.00 MATERIALS for CARDIOVASCULAR DEVICES
Giorgio SOLDANI (Pisa - Italy)

17.30 ROLE of BIOMATERIALS in INTENSIVE CARE UNIT and SURGERY
Antonio GISMONDI (Lecce - Italy)

18.00 INNOVATIVE BIOMATERIALS in OPHTHALMOLOGY
Piera VERSURA (Bologna - Italy)

18.30 RECONSTRUCTIVE and PLASTIC SURGERY: ROLE OF BIOMATERIALS
Margherita GIORGETTI (Pisa - Italy)

19.00 MATERIALS and BIOMATERIALS in GENERAL SURGERY: STATE-OF-THE-ART and PERSPECTIVES
Domenico CALO' (Mesagne - Italy)

19.30 - 20.30 TECHNICAL EXHIBITION and PRACTICAL DEMONSTRATIONS

Tutorial Sessions 24 September, 1992

Session IX COMPATIBILITY

Chairmen : A. S. HOFFMAN (Seattle) - A.. DISTANTE (Pisa)

9.00 GENERAL ASPECTS of QUANTITATIVE BIOCOMPATIBILITY
Arturo PIZZOFERRATO (Bologna - Italy)

9.30 HUMAN ENDOTHELIAL CELL COMPATIBILITY with SYNTETIC MATERIALS.
Rosella SBARBATI (Pisa - Italy)

10.00 QUANTITATIVE HISTO-MORPHOMETRY to ASSAY TISSUE RESPONSE to BIOMATERIALS
Pascal CHRISTEL (Paris - France)

10.30 BACTERIAL ADHESION AND TISSUE COLONIZATION
Pietro SPEZIALE (Pavia - Italy)

11.00 - 11.30 COFFEE BREAK

Session X NORMAL FUNCTION, SIDE EFFECTS and COMPLICATIONS

Chairmen : P. CHRISTEL (Paris) - A. PIZZOFERRATO (Bologna)

11.30 CURRENT STATUS of CARDIAC VALVE DESIGN: PROGRESSES and PITFALLS
Riccardo PIETRABISSA (Milano - Italy)

12.00 RELEASE of METALLIC IONS and CORROSION of METALLIC MATERIALS
Alberto CIGADA (Milano - Italy)

12.30 BIOMATERIAL INFECTIONS: CLINICAL IMPACT, CONSEQUENCES and SURVEILLANCE
Lorenzo MINOLI (Pavia - Italy)

13.00 HOW to DIAGNOSE DYSFUNCTION of IMPLANTED CARDIOVASCULAR DEVICES
Alessandro DISTANTE (Pisa - Italy)

13.30 - 15.00 LUNCH and TECHNICAL EXHIBITION

Session XI DRUG DELIVERY and BIODEGRADABLE SYSTEMS

Chairmen: I. V. YANNAS (Cambridge) - P. FERRUTI (Brescia)

15.00 DRUG-DELIVERY SYSTEMS BASED on STIMULUS-RESPONSIVE POLYMER & HYDROGELS
Allan S. HOFFMAN (Seattle - U.S.A.)

15.30 BIODEGRADABLE & BIOERODIBLE POLYMERS for PHARMACO-MEDICAL APPLICATIONS
Emo CHIELLINI (Pisa - Italy)

16.00 NOVEL POLYSACCARIDE/BIOPOLYMER BLENDS for BIODEGRADABLE APPLICATIONS
Stella SCANDOLA (Bologna - Italy)

16.30 MODELLING and PROPERTIES of BIODEGRADABLE SYSTEMS
Salvatore IANNACE (Napoli - Italy)

17.00 REACTIVE PROCESSING as METHOD for IMPROVING PERFORMANCES of BIODEGRADABLE MATERIALS
Mario MALINCONICO (Napoli - Italy)

17.30 - 18.00 COFFEE BREAK and TECHNICAL EXHIBITION

Session XII ROUND TABLE on : BIOENGINEERING and BIOMATERIALS

Chairmen: A. RIZZO (Lecce) - P. GIUSTI (Pisa)

18.00 LASER TECHNOLOGY & CATHETERS in MEDICINE
Leonardo MASOTTI (Firenze- Italy)

COMPOSITE MATERIALS for REPRODUCING MECHANICAL BEHAVIOUR of NATURAL TISSUE
Luigi AMBROSIO (Napoli - Italy)

FORM & PERFORMANCE of INTELLIGENT MATERIALS
Allan S. HOFFMAN (Seattle - USA)

BIOSENSORS
Danilo DE ROSSI (Pisa - Italy)

20.30 SOCIAL DINNER

Scientific Sessions 25 September 1992

Session A From PATHOLOGY to CHEMISTRY up to IMPLANTS

Chairmen : A.. L' ABBATE (Pisa) - M.S. SCANDOLA (Bologna)

9.00 In VIVO MARKERS of ABNORMALITIES in ARTICULAR CARTILAGE METABOLISM
Eugene THONAR (Chicago - U.S.A.)

9.20 BIOARTIFICIAL POLYMERIC MATERIALS
Paolo GIUSTI (Pisa - Italy)

9.40 TEMPLATES for ORGAN REGENERATION
Ioannis YANNAS (Cambridge - U.S.A.)

10.00 SPECIFICATIONS for ARTIFICIAL LIGAMENT REPLACEMENT
Pascal CHRISTEL (Paris - France)

10.20 NEW TITANIUM ALLOYS DESIGNED for IMPLANT MATERIALS
Tetsuya TATEISHI (Tsukuba - Japan)

10.40 THEORETICAL MODEL for the ELASTIC CONSTANTS of ISOTROPIC BIO COMPOSITES
Victor E. M. J. VAN DOREN (Antwerp - Belgium)

11.00 - 11.30 COFFEE BREAK

Session B BIOCOMPATIBILITY: CONCEPTS and ASSESSMENT

Chairmen : A. HOFFMAN (Seattle) - C. TANZI (Milano)

11.30 PLASMA-ENHANCED CHEMICAL VAPOR DEPOSITION
Riccardo d'AGOSTINO (Bari - Italy)

11.50 ROLE of FIBRONECTIN and COLLAGEN on BACTERIAL ADHERENCE to SOFT and HARD TISSUES and CARDIOVASCULAR DEVICES
Piero SPEZIALE (Pavia - Italy)

12.10 ACHIEVING RECOGNITION and SPECIFICITY in BIOMATERIALS
Buddy RATNER (Seattle - U.S.A.)

12.30 EFFECTS of DERIVATIZED SOLUBLE or INSOLUBLE POLYMERS on CULTURED CELLS
Thierry AVRAMOGLOU (Villetaneuse - France)

12.50 QUANTITATIVE CHARACTERIZATION of BIOCOMPATIBILITY
David WILLIAMS (Liverpool - U.K.)

13.30 - 15.00 LUNCH and TECHNICAL EXHIBITION

Session C TREATMENT, CHARACTERIZATION and IMPROVEMENT of MATERIALS

Chairmen: E. THONAR (Chicago) - E. CHIELLINI (Pisa)

15.00 NEW HYPOTHESES on the BLOOD COMPATIBILITY of SYNTHETIC MATERIALS
Buddy RATNER (Seattle - U.S.A.)

15.20 LONG-STANDING DACRON PROSTHESES for VASCULAR REPAIR : BIOLOGICAL or CHEMICO-PHYSICAL DEGRADATION ?
Maria Cristina TANZI (Milano - Italy)

15.40 NOVEL SURFACE PROCESS TECHNOLOGIES for FABRICATED CARDIOVASCULAR DEVICES
Takehisa MATSUDA (Osaka - Japan)

16.00 PLASMA-ENHANCED CHEMICAL VAPOR DEPOSITION of ORGANOSILICON THIN FILMS for BIOMEDICAL APPLICATIONS
Francesco FRACASSI (Bari - Italy)

16.20 SYNTHESIS, PROPERTIES and BIOMEDICAL APPLICATIONS of HEPARINE-COMPLEXING TER-AMINO POLYMERS
Paolo FERRUTI (Brescia - Italy)

16.40 - 17.10 COFFEE BREAK

Session D TECHNOLOGICAL and BIOMEDICAL APPLICATION of INTELLIGENT MATERIALS

Chairmen: I. V. YANNAS (Cambridge) - R. CARAMAZZA (Bologna)

17.10 INTELLIGENT MATERIALS, SYSTEMS and STRUCTURES: an OVERWIEW
Craig ROGERS (Blacksburg - U.S.A.)

17.30 APPLICATIONS of INTELLIGENT POLYMERS in BIOTECHNOLOGY
Allan HOFFMAN (Seattle - U.S.A.)

17.50 INTELLIGENT MATERIALS for CARDIOVASCULAR APPLICATIONS
Takehisa MATSUDA (Osaka - Japan)

18.10 PROTEIN MONOLAYERS by the LANGMUIR BLODGET TECHNIQUE
Danilo DE ROSSI (Pisa - Italy)

18.30 BIOMEDICAL APPLICATIONS of SHAPE MEMORY ALLOYS
Craig ROGERS (Blacksburg - U.S.A.)

19.00 - 20.00 TECHNICAL EXHIBITION and PRACTICAL DEMONSTRATIONS

26 September, 1992

Scientific Poster Session

From 9.00 to 11.00

POSTER PRESENTERS are REQUESTED to be AVAILABLE at the POSTER SITE for all the DURATION of the SESSION.

The SESSION will be CONCLUDED by an OPEN DISCUSSION COORDINATED by a MODERATOR

11.30 CONCLUSIVE LECTURE

Paolo CAVALIERE,
President of C.N.R.S.M.

Scientific Parks in Italy: new perspective for an old country

13.00 FAREWELL LUNCH

N.B.

All the Partecipants interested to visit the C.N.R.S.M. and the *SCIENTIFIC PARK* of Brindisi are invited to contact the desk of Secretariat (dott.ssa Maria Grazia Resta and Sig. Pino Olive) for details about the time scheduling of the visit and about transportation neither to the Scientific Park and/or to the airports or to train station or to the bus station.

MATERIALS FOR CARDIOVASCULAR DEVICES

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Cardiovascular devices have several requirements for the materials used in their fabrication. In order to frabricate an economical, safe and effective device, chemical, physical and biological properties of the material must be carefully evaluated along whit its processability characteristic. Materials utilized up to date in cardiovascular devices come from the broad range of commercially available materials, but they have to be categorically tested for being acceptable for use in contact with blood. Application for these materials include extracorporeal devices, cather and tubing which are inserted into a blood vessel, or devices which can be permanently implanted.Specifically, these biomedical materials include polymers such as polyethyeneterephthalate and polytetrafluoroethylene used in vascular grafts, biodegradablepolymers such as polylactic/glicolic acid copolymers used as experimental vascular grafts, biologically derived materials such as glutaraldehyde tanned porcine heart valves for heart valve prostheses, bioderived macromolecules such as aldehyde tanned collagen used as a biodegradable coating on textile vascular grafts, passive coating such as hydrogels used to increase lubricity of catheters, bioactive coating such as bound heparin to reduce the thrombosis on catheters, and carbons such as pyrolitic carbon used as a heart valve component.Another large famiuly of materialsthat show interesting propertics for biomedical applications is that of polyurethanes. These materials are biocompaqtibile and do not present any undesirable reaction with the the bilogical fluids. Polyurathanes have been used in diverse biomedical applications such as endotracheal tubing, vascular prosthesis, cardiac assisting devices and aorto-coronary by-bass, artificial cardiac valve, pace-maker insulators, roller blood pump tubing for the artificial heart, breast implants and dialysis membranes. After an overview of the general properties of the materials for cardiovascular devices, this talk will be restricted to the properties of the materials for vascular grafts with particular emphasis on the small-diameter vascular grafts area. We will also illustrate our own approach to vascular grafts fabrication from polyurethanes which relies on a spray technique associated to a phase-inversion effect of a polymer solution. The principle, which is at the base of this process, is to use a thermodynamically unstable synthetic polymer solution to produce spongy tubular membranes through the depositio of polymer layers of controlled porosity onto a rotating mandrel. As a result of this unique material processing, membranes display a tridimensional, interconncted filamentous porous structure with a hydrophilic behavior.

Structural properties of these membranes are such that display a very open luminal surface and a high wall porosity, while the entire membranes show low hydraulic permeability (HP). The HP measured collecting in the first minute the water passing through the membrane wall under a head pressure of 120 mmHg resulted 39 +/- 8 ml/min/cm^2 afterwards HP reduced functioning of time. This is attributed to the membrane wall structure which is compressible and, therefore, adapts dynamically to varations of luminal pressure (LP). By varying some of the parameter of the "spraying, phase-inversion" technique the fine gel-like structure of the tubular membranes can be widely varied, that is membranes can be fabricated with wall structure features different from those of the luminal surface. In addition this techinque allows us to prepare materials incorporating bioactive peptides, for instance endothelial cell growth factors, which will be slowly released to stimulate cell proliferation.