Theme

Advanced Materials Enabling New Functions

Program

Start 10:00~10:05	<Information>
Speech 10:05~10:15	**Dr. Hiroyuki Nakanishi** (Chairman and President, Mitsui Chemicals, Inc., Japan)
Lecturers 10:15~11:05	**Prof. Jean-Marie Lehn** (ISIS-University Louis Pasteur, France) DYNAMERS: Dynamic Molecular and Supramolecular Polymers
11:05~11:55	**Prof. Makoto Fujita** (The University of Tokyo, Japan) Function through Architecture: Metal-Directed Self-Assembly of Large Hollow Frameworks as Applied to Molecular Flasks
11:55~14:00	<Lunch> *Poster Session*
14:00~14:50	**Prof. Gero Decher** (ICS- University Louis Pasteur and CNRS, France) Design of Functional Surfaces
14:50~15:40	**Prof. Rolf Mülhaupt** (Albert-Ludwigs University Freiburg, Germany) New Routes to Polymerization Catalysts and Advanced Polyolefin Materials
15:40~16:20	<Coffee Break> *Poster Session*
16:20~17:10	**Dr. Terunori Fujita** (Research Fellow, Catalysis Science Laboratory, Mitsui Chemicals, Inc., Japan) Creation of Value-Added Polymers Using New Olefin Polymerization Catalysts
17:10~18:00	**Prof. Jun Okuda** (RWTH Aachen University, Germany) Polymerization Catalysis by Structurally Defined Organometallics
Closing address 18:00~18:05	**Dr. Akihiro Yamaguchi** (Managing Director, Mitsui Chemicals, Inc., Japan)
19:00~21:00 (Open 18:40)	<Cocktails & Banquet> *Hotel Hilton Strasbourg*

Posters

ISIS-University Louis Pasteur

- Dynamic Constitutional Self-Sensing in a Zinc^{II} / Poly-Iminofluorenes System
- Generation of Dynamic Constitutional Diversity and Driven Evolution in Helical Molecular Strands under Lewis Acid Catalyzed Component Exchange
- Dynamic Polymer Blends
  - intersectional exchange between polymer main chains -

ICS-University Louis Pasteur and CNRS

- Design of Complex Macromolecular Architectures via Coordination (co-) Polymerization of Macromonomers
- New Bisamide Organogelators: Relationship between Chemical Structure and Nanoscale Organisation

RWTH Aachen University

- Bisphenolic Titanium Benzyl Complexes with 1, ω-Dithiaalkanediyl Bridges for Styrene Polymerization: A Structure-Selectivity Study

Mitsui Chemicals, Inc.

- Functional Olefin Polymer
- PDP Optical Filter
- Dinotefuran : A Novel Systemic Insecticide
- Nucleosides : An Unprecedented Chemo-Enzymatic Hybrid Process
- Super Wettable Coating Film
- Blown Film Process of Ultra-High Molecular Weight Polyethylene
- New Polymers by FI Catalysts

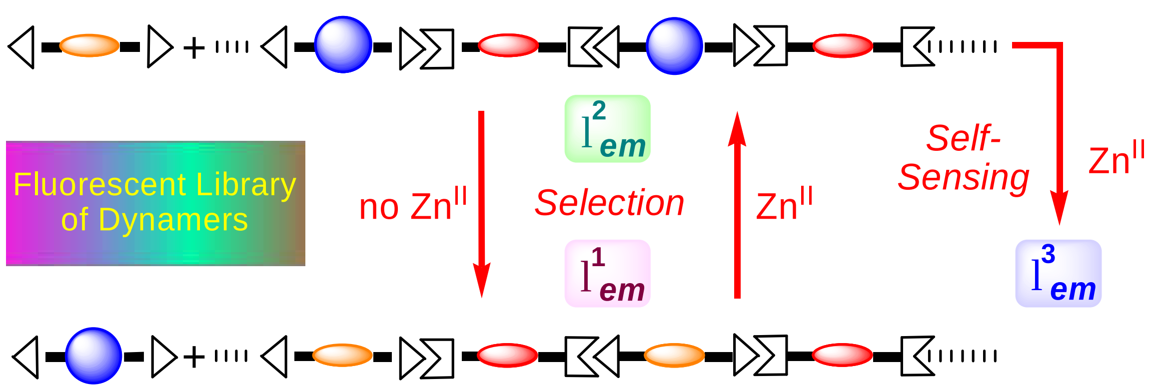
Dynamic Constitutional Self-Sensing in a Zinc^{II} / Poly-Iminofluorenes System

Nicolas Giuseppone and Jean-Marie Lehn

Institut de Science et d'Ingénierie Supramoléculaires (ISIS), 8 Allée Gaspard-Monge, BP 70028, 67083 Strasbourg, France

ABSTRACT

The interaction of an external effector, Zn^{II} ions, with a constitutional dynamic library of fluorescent poly-iminofluorenes leads to component exchange, that generates an entity responding by a change in emission to the effector which has induced its formation. The overall coupled system displays a tuning of optical signal, resulting from two synergistic processes: adaptative constitutional reorganization and self-sensing. In broader terms, this work highlights the perspectives opened by constitutional dynamic chemistry toward the design of smart materials, capable of expressing different latent properties in response to environmental conditions.



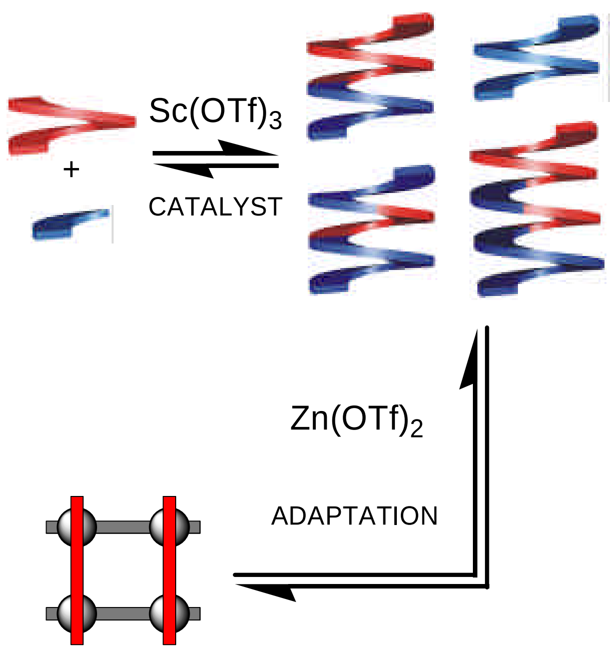
Generation of Dynamic Constitutional Diversity and Driven Evolution in Helical Molecular Strands under Lewis Acid Catalyzed Component Exchange

Nicolas Giuseppone, Jean-Louis Schmitt and Jean-Marie Lehn

Institut de Science et d'Ingénierie Supramoléculaires (ISIS), 8 Allée Gaspard-Monge, BP 70028, 67083 Strasbourg, France

ABSTRACT

Dynamic Constitutional Library of Helical Strands. Constitutional dynamics, self-assembly and helical folding control are brought together by the efficient $Sc(OTf)_3$ catalyzed transimination of helical oligohydrazone strands, yielding a highly diverse constitutional dynamic library through assembly, dissociation and exchange of components. This library can subsequently undergo driven evolution in the presence of Zn^{II} ions to express preferentially [2x2] grid-like arrays by component recombination.



Dynamic Polymer Blends
- intersectional exchange between polymer main chains -

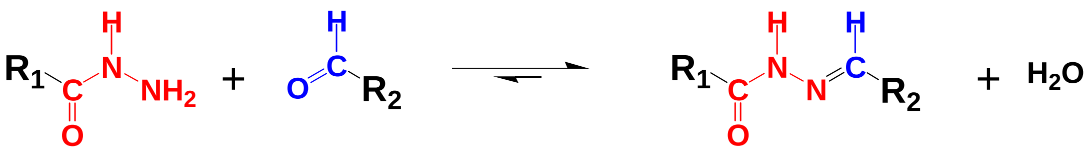
Takashi Ono* and Jean-Marie Lehn**

** Mitsui Chemicals, Inc.*

*** Institut de Science et d'Ingénierie Supramoléculaires (ISIS)*

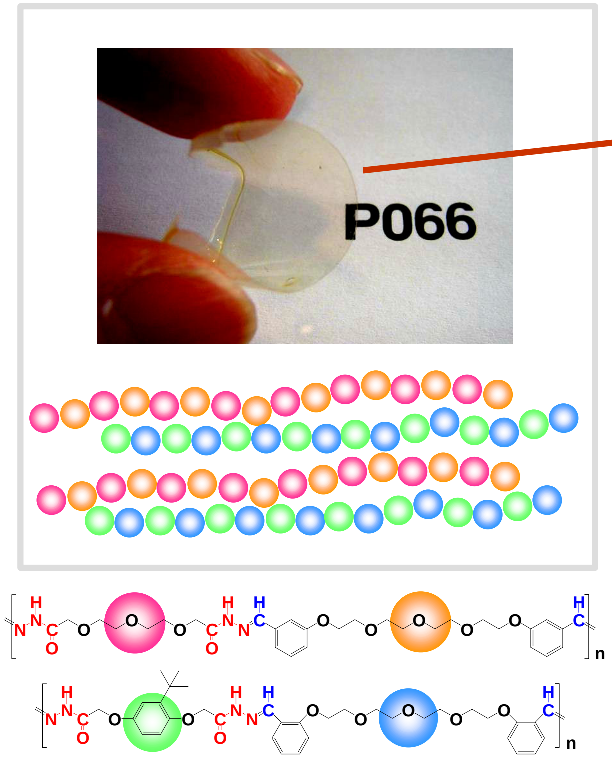
ABSTRACT

The polymers consisting of acylhydrazone bonds in the main chains, which are formed simply by polycondensation with diacylhydrazines and dialdehydes, were found to show intersectional exchange reaction between the main chains in the solid state. Although the reaction was enhanced by heating, it occurred even at room temperature without any external stimulus.

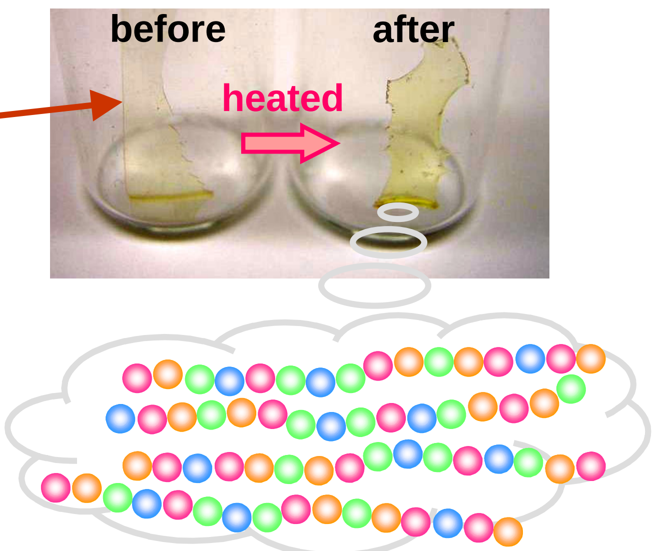


acylhydrazine   aldehyde   acylhydrazone

polymer blend film
consisting of two kinds polymers



only heated at 120C for 2min
as a neat polymer



Although there is no specific change in appearance, a random copolymer was formed through exchange reaction. (confirmed by ^{1}H-NMR)

Institut Charles Sadron

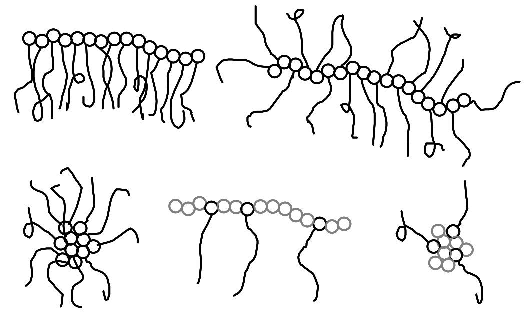
Design of Complex Macromolecular Architectures based on Coordination (co-) Polymerization of Macromonomers

F. Peruch and P. J. Lutz

Institut Charles Sdaron, 6 rue Boussingault, 67000 Strasbourg

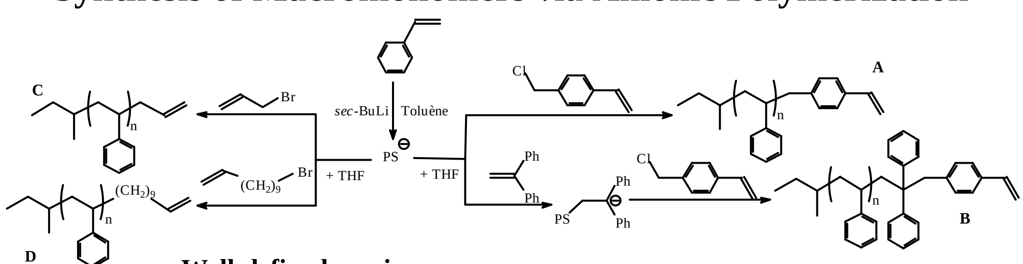
Macromolecular Enginnering via Macromonomers

- Macromonomers: well-defined polymeric species carrying a polymerizable entity at one or both chain ends (unsaturation, heterocycle)
- Designed as well-defined building blocks for various macromolecular architectures:
- Potential important applications: precursors for graft copolymers (compatibilizers in polymer blends), surface modification, hydrogels for biomedical applications,



comb-shaped, palm tree, graft copolymers, …. networks,

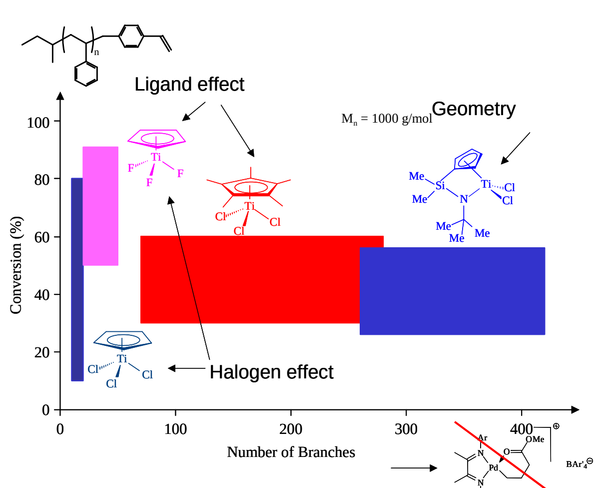
Synthesis of Macromonomers via Anionic Polymerization



Well-defined species :

- Controlled molar masses, narrow molar mass distribution
- Almost quantitative functionalization
- Extension to other polymers water-soluble …

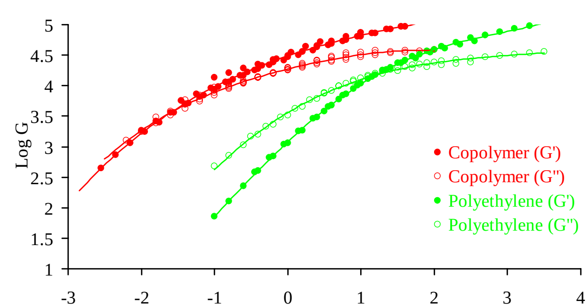
Homopolymerization :



Influence of the nature of the catalyst

Copolymerization :

Ethylene with PS macromonomers with allyl or undencenyl end-groups



Solid State properties ….

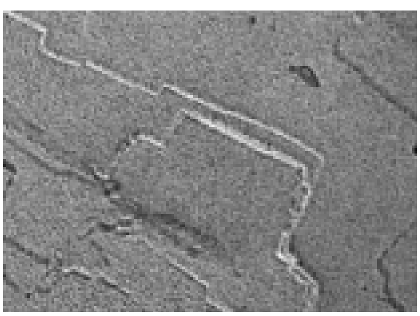
New bisamide organogelators: Relationship between chemical structure and nanoscale organisation

Nancy Diaz, François-Xavier Simon, Marc Schmutz, Michel Rawiso, Gero Decher & Philippe J. Mésini*

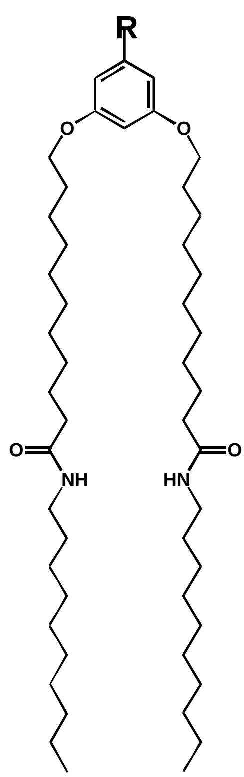
Institut Charles Sdaron, 6 rue Boussingault, 67000 Strasbourg

mesini@ics.u-strasbg.fr

The studied compounds I self assemble in organic solvents to form gels. The structures of these gels have been investigated by EM (see figures) and Small angle scattering techniques. The size and nature of the ester group controls the extent and dimension of the nano-aggregates.



R = H



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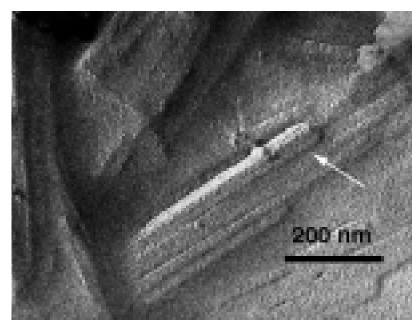
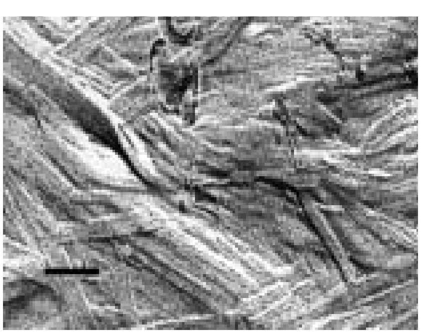


R = $COOCH_3$



R = $COOCH_2CH_2CH(CH_3)_2$

R = $COO\,(CH_2)_nCH_3$

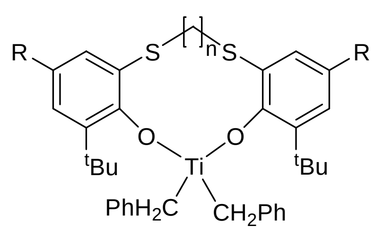
Bisphenolic Titanium Benzyl Complexes with 1, ω- Dithiaalkanediyl Bridges for Styrene Polymerisation: A Structure-Selectivity Study

R. Manivannan, T.P. Spaniol and J. Okuda*

Institute of Inorganic Chemistry, RWTH Aachen University,

Professor-Pirlet- Str. 1, D-52074 Aachen, Germany

Metallocenes is one of the widely studied single-site catalysts precursors with well-established structure-selectivity relationships towards propylene polymerisation[1]. With the introduction of variety of new generation 'non-metallocenes' precursors, novel polymeric materials became imaginable[2]. Recently a novel class of non-metallocenic catalyst precursors, based on bisphenolic moiety was introduced from our group for isospecific polymerisation of styrene[3]. It was found that minor changes in the ligand backbone had a profound effect on the selectivity of polymer obtained. In this presentation, our understanding of this difference in structure-selectivity pattern, as studied with well-defined benzyl complexes of the dithia-linked ligands (shown below) will be highlighted.



n= 2 or 3

R= ^{t}Bu, CH_3, OCH_3

References

1. H. H. Brintzinger, D. Fischer, R. Mülhaupt, B. Rieger, R. M. Waymouth, *Angew. Chem. Int. Ed. Engl.* **1995**, *34*, 1143 - 1170.
2. V. C. Gibson, S. K. Spitzmesser, *Chem. Rev.* **2003**, *103*, 283 - 315.
3. C. Capacchione, A. Proto, E. Ebeling, R. Mülhaupt, K. Möller, T.P. Spaniol, J. Okuda, *J. Am. Chem. Soc.* **2003**, *125*, 4964 - 4965.

Functional Olefin Polymers

Functional Polymeric Materials Business Group is based on its competence in catalysis science, polymer science, polymerization process and the various polymer technologies such as modification, polymer compounding and polymer fabrication technologies.

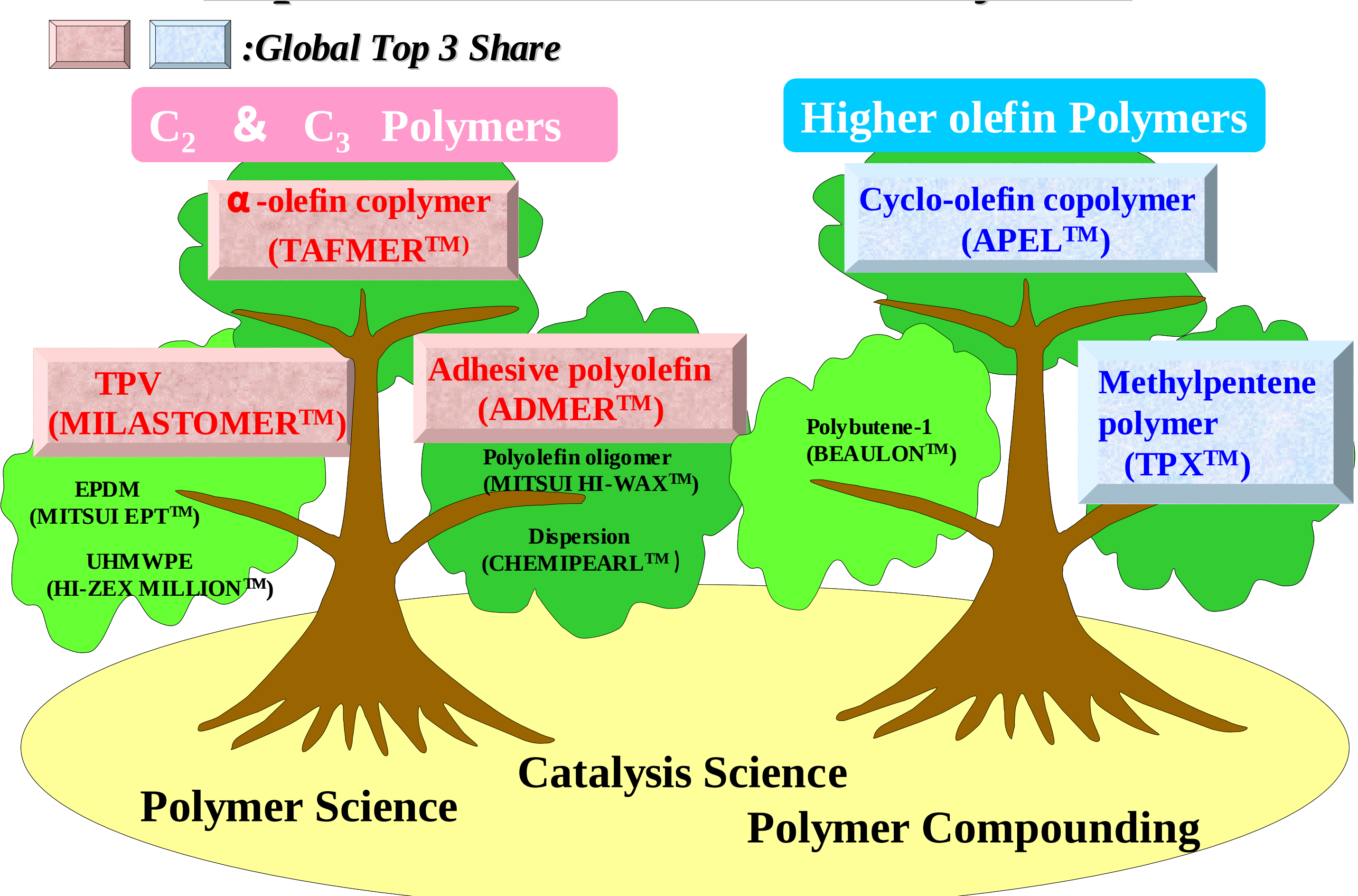
Focused market segments:

- **Information & electronic materials**
- **Automobile materials**
- **Functional packaging materials**

Global top 3 shared products:

- **α-olefin copolymer**
- **TPV**
- **Adhesive polyolefin**
- **Methypentene polymer**
- **Cyclo-olefin copolymer**

Expand Functional Olefin Polymers



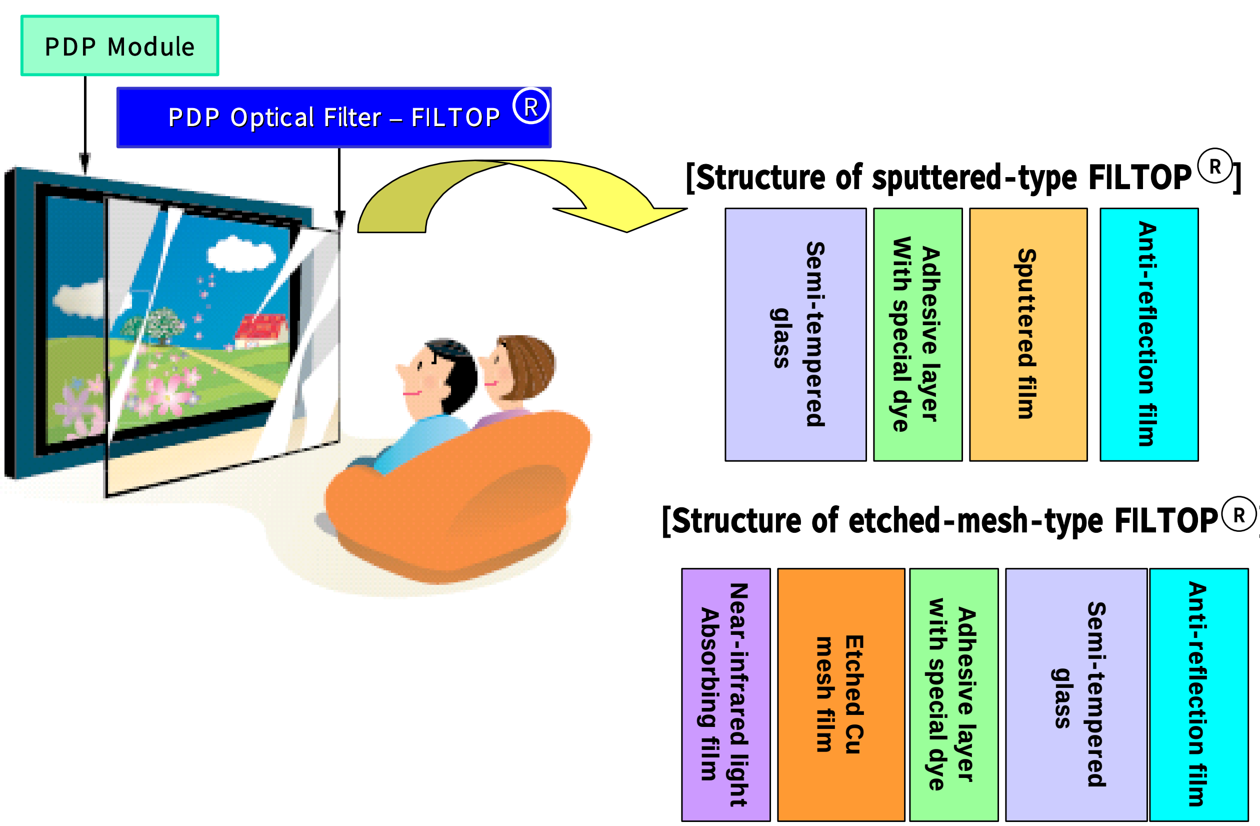
PDP Optical Filter

Mitsui Chemicals will be always the Fore-Runner of PDP Optical Filter Development.

<Features>

- Greatly Improved Color and Picture Quality by using our Extensive Dye Technologies
- Excellent EMI Shielding Properties
- Superior NIR Light Blocking properties
- PDP Module Protection
- Surface Reflection Reduction

More Beautiful Picture on PDP



Dinotefuran：A Novel Systemic Insecticide

– its History of Discovery, its Characteristics and Application for Insect Control

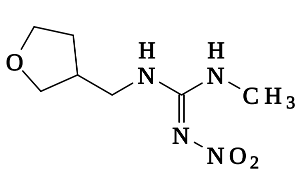
Dinotefuran [(RS)-1-methyl-2-nitro-3-[(3-tetrahydrofuryl)methyl]guanidine] is a novel systemic insecticide developed by Mitsui Chemicals, Inc. Dinotefuran has a tetrahydrofuran ring in its structure instead of aromatic heterocycles such as chloropyridine, which were considered necessary for chloronicotinyls or neo-nicotinoids previously, and has no halogen atom in its structure. Therefore dinotefuran shows a new mode of action comparing existing insecticide, for example organic phosphates, carbamates, synthetic pyrethroids and existing neo-nicotinoids, and is friendly for environment. Dinotefuran shows broad spectrum, has excellent systemic characteristics, and shows excellent insecticidal activities by low dosage. Dinotefuran can be used for various crops in paddy rice, fruits trees and vegetables fields because of its low influence on mammals, birds and aquatic lives, and low phytotoxicity for crops.

MTI-446: Novel Insecticide for Agriculture, Environmental & Animal Health

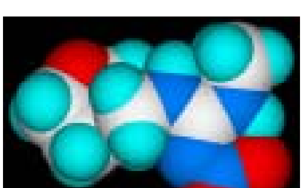
Mitsui Chemicals

ISO Name: dinotefuran (Trade Name: Starkle™, Albarin™)

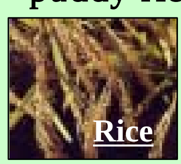
Application: a. Agriculture - paddy rice, fruits, vegetables, ornamentals



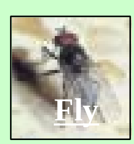
< Chemical Structure >



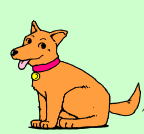
< X-ray Structure >



b. Environmental Health - cockroach, fly, mosquito



c. Animal Health - flea & tick on cats & dogs



Safety: Low Toxicity for Mammals, Birds and Aquatic Animals
Low Phytotoxicity for Crops

Registration: Japan: May 2002, USA: 2004, EU: 2008

MTI-446: Global Strategical Insecticide in Mitsui Chemicals

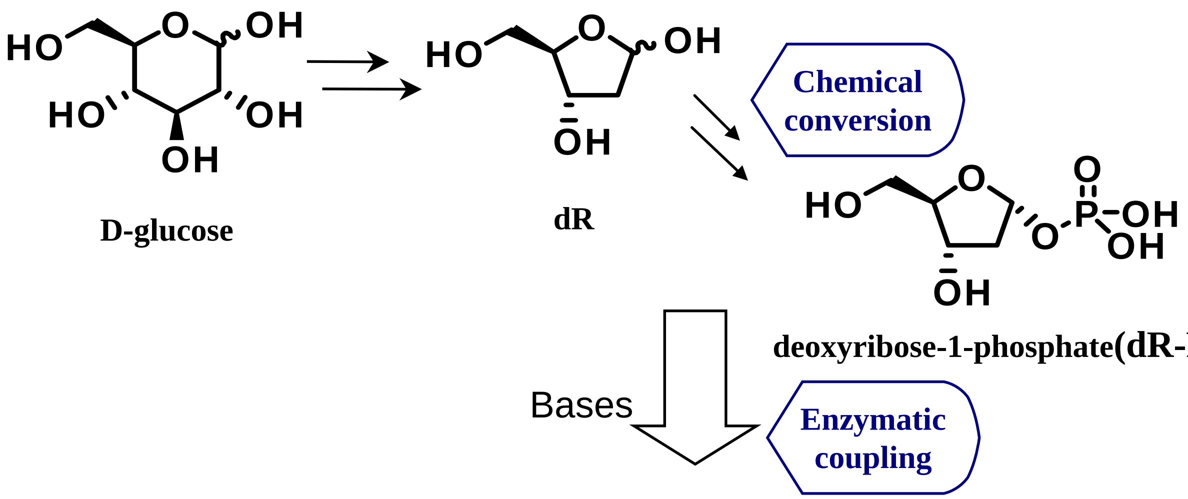
Deoxynucleosides

An Unprecedented Chemo-enzymatic Hybrid process

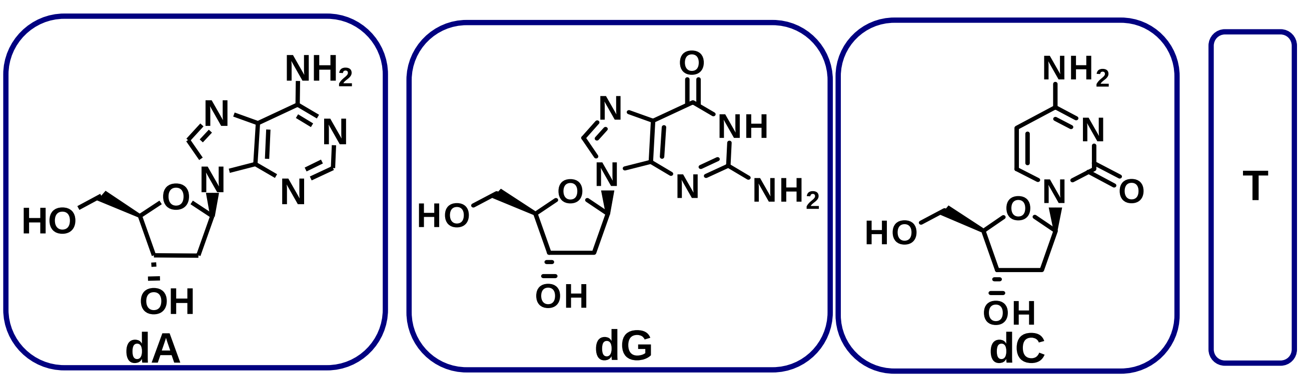
In a world first,Mitsui Chemicals has developed a commercial-scale synthetic process for deoxynucleosides.

Two sophisticated technologies enables us to make deoxynucleosides very effectively.

1) Stereo selective sugar phosphates by an interesting chemistry.
2) Stereo selective coupling of the sugar phosphates with bases by a smart enzyme.



Four natural type deoxynucleosides and other analogues are available!



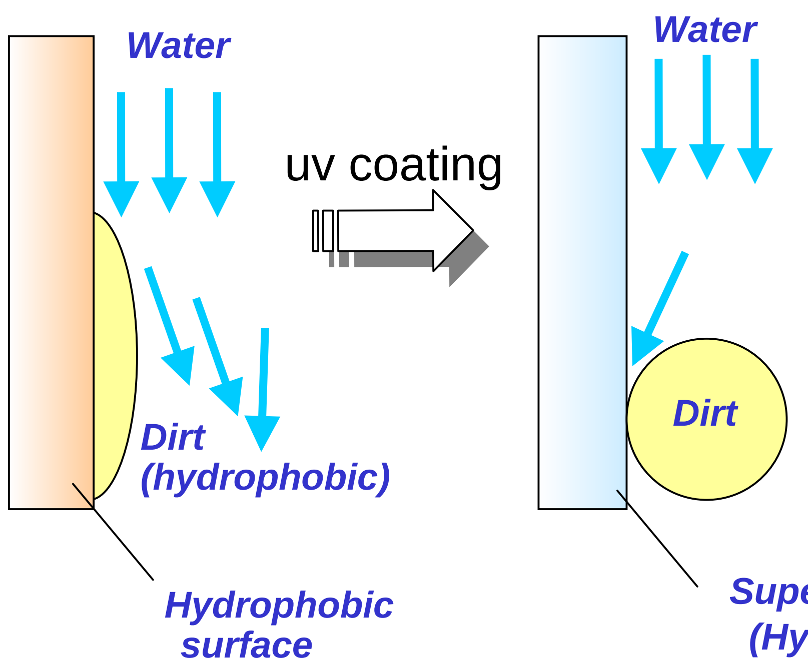
5'-O-Dimethoxytrityl compounds are also available as building blocks for Oligo.

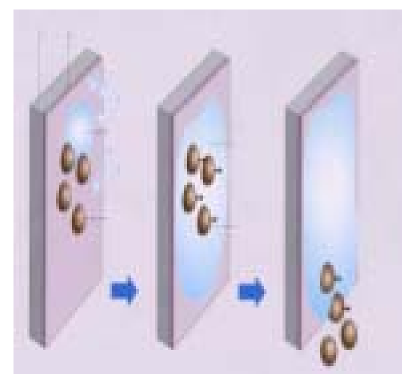
Our experienced quality assurance system offers you high quality ,clear impurity profiles and animal free materials for pharmaceutical application.

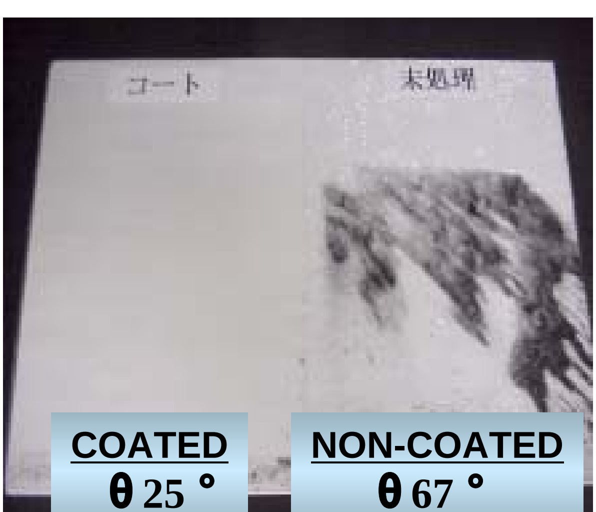
MITSUI CHEMICALS, INC.

Super Wettable Coating Film

- Our great design technology of hydrophilic monomers enabled to invent the new material which has great performance (high wettability).
- The coated surface of this resin shows the contact angle of water is less than 30 or 20 degree.
- This hydrophilic coating is effective for self-cleaning and anti-fog material.







Motor oil/charcoal on PMMA sheet

<PROPERTIES>
Water contact angle: 20 - 30 °
Pencil hardness: 3H - 4H
Surface resistance: $10^{12}\Omega$
(at 23℃・50~55%RH)

● Blown Film Process of Ultra-High Molecular Weight Polyethylene

Takashi Nakahara, Hirofumi Zenkoh, Kazuo Yagi

Electronic &Engineered Materials Laboratory, Mitsui Chemicals, Inc.

Abstract

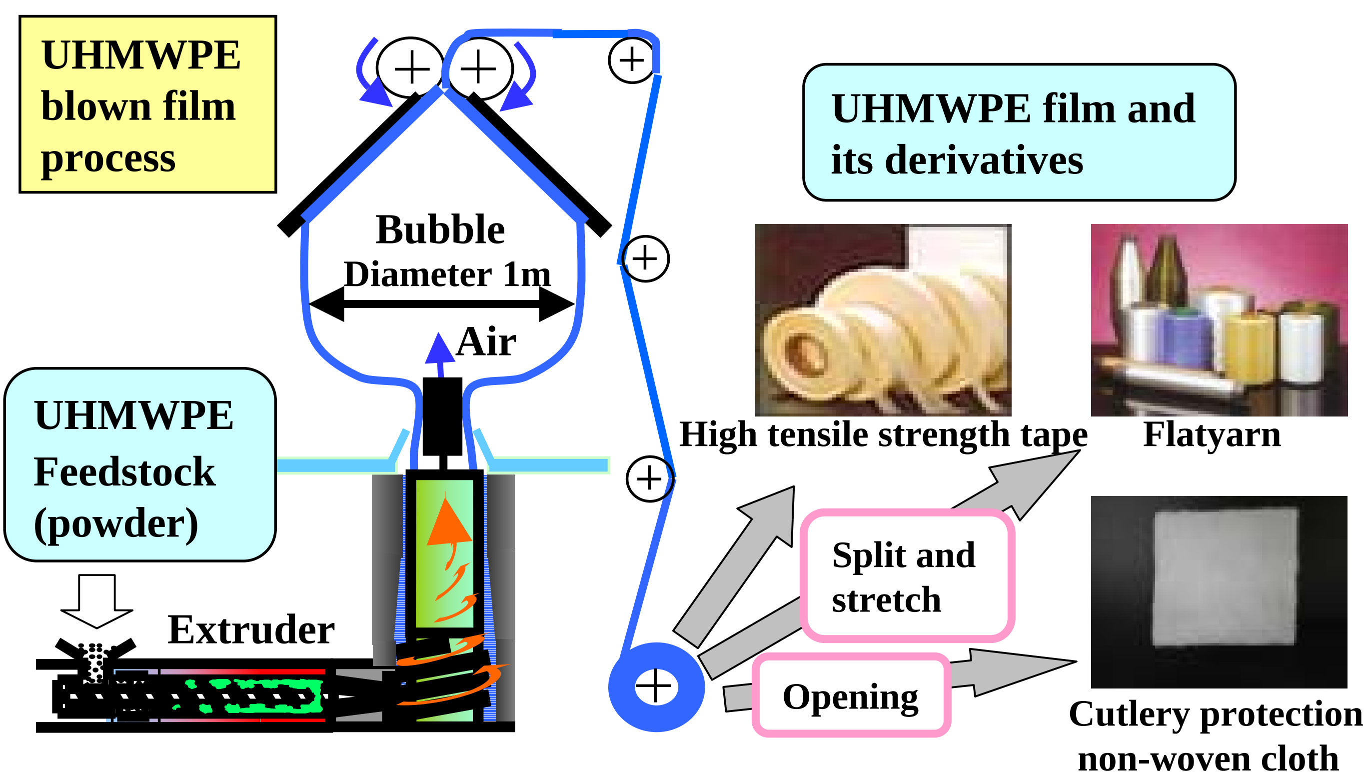
In spite of its excellent physical properties, it is very difficult to form Ultra-High Molecular Weight Polyethylene (UHMWPE) into film, because of its extremely high melt viscosity. Our new brown film process enabled that granular UHMWPE powder is continuously shaped into biaxially oriented film at economical speed without any plasticizer. This process consists of a single screw extruder with full flight screw, special rotating crosshead circular die with a coaxial screw, and a tall neck type tubular film stretching unit. The UHMWPE blown film obtained by new process shows remarkably high tensile strength and abrasion resistance compared with conventional PE films. It has been commercialized for various high performance film i.e. a lining film, a high strength flat yarn with stretching .

One and only very thin UHMWPE film forming process without any plasticizer

Very thin ⇒ 5～140 μm

High-tensile strength ⇒ 150～250MPa

High-processing speed ⇒ max. 50kg/hr



ISIS Poster: New Polymers by FI Catalysts

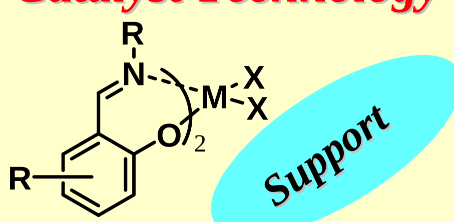
Mitsui Chemicals

Mitsui's new and original olefin polymerization catalysts, *FI Catalysts*, are capable of controlling the molecular weight values of polymers by ligand oriented catalyst design. It is noteworthy that FI Catalysts have succeeded in the production of very low *Mw* polyethylene having a vinyl-end group (FI-oligomer), which can not be achieved by conventional catalyst systems. Recently, Mitsui developed a variety of functionalized oligomers for modifiers, compatibilizers, heat-resistant waxes, anti-static agents, etc, via a modification of FI-oligomers.

In the field of high *Mw* polymers, on the other hand, FI Catalysts can produce ultra-high molecular weight polyethylene, suitable for applications demanding high strength such as bulletproof vests, artificial bones, and artificial legs. Furthermore, owing to Mitsui's invention of a new supporting system for FI Catalysts, Mitsui has managed to control polymer morphology (shape and size). This new breakthrough will lead to the creation of advanced materials composed of ultra-fine polyethylene particles.

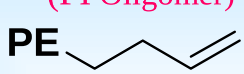
In the near future, Mitsui Chemicals will open up a market for brand-new polymeric materials based on FI Catalyst technology.

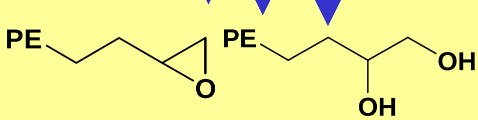
FI Catalyst Technology



Vinyl-terminated Low Mw PE

(FI Oligomer)





and their derivatives

- •modifiers
- •compatibilizers
- •heat-resistant waxes
- •anti-static agents etc.

Ultra High Mw PE

High-Strength Materials

e.x.
bulletproof vests
artificial bones
artificial legs

Control Polymer Morphology

Ultra fine PE particle