

宇根山健治教授（岡山大 工） 米国化学会賞を受賞

概要：

米国化学会（会員数158,000人の世界最大の学会）は9月11日の機関誌C & EN News ;Chemical & Engineering Newsで2007年の化学会賞受賞者を発表した。岡山大学工学部 宇根山健治教授はACS Award for Creative Work in Fluorine Chemistryを受賞することになった。受賞記念講演は2007年1月にフロリダで行われる米国化学会主催第18回フッ素化学会議で、また、受賞式ならびに受賞記念シンポジウムSymposium in honor of Professor K. Uneyamaは3月シカゴでの第233回米国化学会において行われる。

受賞研究（強い炭素－フッ素結合を容易く切る方法）

テフロンでお馴染みのフッ素系化学物質は強くて壊れない、と云う昔からのイメージを払拭させて、その強い炭素－フッ素結合を容易く切る新しい方法の開発に初めて成功し、学術的成果として高い評価を受けた。フッ素系化学物質は日常生活で広く使われていることから、宇根山教授が開発した方法は、医薬や電子材料など新しいフッ素系化学物質を有効に製造することを可能にするものであり、今後の応用が期待される。

日本人としては2人目：

この賞（ACS Award for Creative Work in Fluorine Chemistry）は1972年に創設され、毎年1人フッ素化学に関する優れた研究業績のあった科学者に授与されるもので、日本人としては2人目（18年前に東京薬科大学の小林義郎教授が受賞している）である。

中国・四国・九州地区から米国化学会賞の受賞は初めて：

米国化学会賞は63部門あり、1967年の熊田教授（京都大 工）以来、過去に24人の日本人が受賞している（別紙）が、中国・四国・九州地区の研究機関から受賞者が出たのは初めてである。

米 国 化 学 会 賞 日 本 人 受 賞 者

年	分野	氏名	(所属)
1967	Silicon Chem.	熊田 誠	(京都大 工)
1978	Natural Product	中西香爾	(コロンビア大)
1978	Polymer Chem.	古川淳二	(京都大 工)
1978	Syn. Org. Chem.	正宗 悟	(MIT)
1978	Silicon Chem.	櫻井英樹	(東北大 理)
1980	Syn. Org. Chem.	岸 義人	(ハーバード大)
1989	Fluorine Chem	小林義郎	(東京薬大 薬)
1990	Cope Award	中西香爾	(コロンビア大)
1992	Carbohydrate Chem.	Kobata Akira	(東京大 医)
1993	Polymer Chem.	三枝武夫	(京都大 工)
1995	Carbohydrate Chem.	小川智也	(理化学研究所)
1995	Peptide Chem	榊原俊平	(ペプチド研究所)
1996	Silicon Chem.	安藤 亘	(筑波大 化)
1996	Syn. Org. Chem.	向山光昭	(東京大 理)
1996	Nakanishi Prize	平田義正	(名古屋大 理)
1997	Cope Award	野依良二	(名古屋大 理)
1998	Org. Met. Chem.	根岸英一	(パーデュー大)
1999	Natural Product	森 謙二	(東京大 農)
2000	Nakanishi Prize	大村 智	(北里大 薬)
2001	Org. Chem.	野依良二	(名古屋大 理)
2001	Natural Product	岸 義人	(ハーバード大)
2001	Medicinal Sub.	尾島 巖	(ニューヨーク大)
2002	Silicon Chem.	玉尾 浩平	(京都大 工)
2004	Syn. Org. Chem.	福山 透	(東京大 薬)
	Chromatography	寺部 茂	(姫路工大 理)
2004	Nakanishi Prize	北川 勲	(大阪大 薬)
2005	Carbohydrate Chem.	大村 智	(北里大 薬)
2006	Syn. Org. Chem.	関口 章	(筑波大 化)
	Nakanishi Prize	安元 健	(日本食品分析センター)
2007	Fluorine Chem.	宇根山 健治	(岡山大 工)
	Cope Scholar	山本嘉則	(東北大 理)

ACS 2007 NATIONAL AWARD WINNERS

FOLLOWING ARE THE RECIPIENTS of awards administered by the American Chemical Society for 2007. Vignettes of the award recipients will appear in C&EN in early 2007. With the exception of the Arthur C. Cope Scholar Awards, these recipients will be honored at the Awards Ceremony on Tuesday, March 27, 2007, in conjunction with the 233rd ACS national meeting in Chicago.

ACS Award for Achievement in Research for the Teaching & Learning of Chemistry sponsored by Prentice Hall, **J. Dudley Herron**, Morehead State University

ACS Award for Computers in Chemical & Pharmaceutical Research, **Emily A. Carter**, Princeton University

ACS Award for Creative Advances in Environmental Science & Technology sponsored by Air Products & Chemicals in memory of Joseph J. Breen, **Richard C. Flagan**, California Institute of Technology

ACS Award for Creative Invention sponsored by Corporation Associates, **Bruce Ganem**, Cornell University

ACS Award for Creative Research & Applications of Iodine Chemistry sponsored by SQM, **Peter J. Stang**, University of Utah

ACS Award for Creative Work in Fluorine Chemistry sponsored by SynQuest Laboratories and Honeywell, **Kenji Uneyama**, Okayama University, Japan

ACS Award for Creative Work in Synthetic Organic Chemistry sponsored by Aldrich Chemical, **Steven V. Ley**, University of Cambridge, England

ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry sponsored by Strem Chemicals, **Robert J. Angelici**, Iowa State University

ACS Award for Encouraging Disadvantaged Students into Careers in the Chemical Sciences sponsored by the Camille & Henry Dreyfus Foundation, **Robyn E. Hannigan**, Arkansas State University

ACS Award for Encouraging Women into Careers in the Chemical Sciences sponsored by the Camille & Henry Dreyfus Foundation, **Bojan H. Jennings**, Wheaton College

ACS Award for Research at an Undergraduate Institution sponsored by Research Corporation, **Cheryl D. Stevenson**, Illinois State University

ACS Award for Team Innovation sponsored by Corporation Associates, **Michael R. Barbachyn** (Pfizer), **Steven J. Brickner** (Pfizer), **Douglas K. Hutchinson** (Abbott Laboratories), and **Peter R. Manninen** (Eli Lilly & Co.)

ACS Award in Analytical Chemistry sponsored by Battelle Memorial Institute, **James W. Jorgenson**, University of North Carolina, Chapel Hill

ACS Award in Applied Polymer Science sponsored by Eastman Chemical, **Harry R. Allcock**, Pennsylvania State University

ACS Award in Chromatography sponsored by Supelco, **J. Michael Ramsey**, University of North Carolina, Chapel Hill

ACS Award in Colloid & Surface Chemistry sponsored by Procter & Gamble, **William B. Russel**, Princeton University

ACS Award in Industrial Chemistry sponsored by the ACS Division of Business Development & Management, **Margaret M. Wu**, ExxonMobil Research & Engineering

ACS Award in Inorganic Chemistry sponsored by Aldrich Chemical, **Sheldon G. Shore**, Ohio State University

ACS Award in Organometallic Chemistry sponsored by Dow Chemical Co. Foundation, **David Milstein**, Weizmann Institute of Science, Rehovot, Israel

ACS Award in Polymer Chemistry sponsored by ExxonMobil Chemical Co., **Ludwik Leibler**, Centre National de la Recherche Scientifique (CNRS), Paris

ACS Award in Pure Chemistry sponsored by Alpha Chi Sigma Fraternity and the Alpha

Chi Sigma Educational Foundation, **Xiao-wei Zhuang**, Harvard University

ACS Award in the Chemistry of Materials sponsored by DuPont, **Robert S. Langer**, Massachusetts Institute of Technology

ACS Award in Theoretical Chemistry sponsored by IBM, **Rodney J. Bartlett**, University of Florida

Award for Volunteer Service to ACS sponsored by ACS, **Morton Z. Hoffman**, Boston University

Roger Adams Award in Organic Chemistry sponsored by Organic Reactions Inc. and Organic Syntheses Inc., **Samuel J. Danishefsky**, Sloan-Kettering Institute and Columbia University

Arthur W. Adamson Award for Distinguished Service in the Advancement of Surface Chemistry sponsored by Occidental Petroleum Corp., **Charles T. Campbell**, University of Washington

Alfred Bader Award in Bioinorganic & Bioorganic Chemistry sponsored by Alfred Bader, **Eckard Münck**, Carnegie Mellon University

Earle B. Barnes Award for Leadership in Chemical Research Management sponsored by Dow Chemical, **Frank J. Williams**, GE Global Research

Ronald Breslow Award for Achievement in Biomimetic Chemistry sponsored by the Breslow Endowment, **François N. Diederich**, Swiss Federal Institute of Technology, Zurich

Herbert C. Brown Award for Creative Research in Synthetic Methods sponsored by the Herbert C. Brown Award Endowment, **David A. Evans**, Harvard University

James Bryant Conant Award in High School Chemistry Teaching sponsored by Thermo Electron Corp., **Eleanor W. Siegrist**, Holidaysburg Area Senior High School, Holidaysburg, Pa.

Arthur C. Cope Award sponsored by Arthur C. Cope Fund, **Jean M. J. Fréchet**, University of California, Berkeley

Arthur C. Cope Scholar Awards sponsored by Arthur C. Cope Fund, **Guillermo C. Bazan** (University of California, Santa Barbara), **André B. Charette** (University of Montréal, Canada), **Janis Louie** (University of Utah),

AWARDS

ACS AWARD IN SEPARATIONS SCIENCE & TECHNOLOGY

The ACS Award in Separations Science & Technology has been reinstated by a vote of the ACS Board Committee on Grants & Awards. Nominations for the 2008 presentation of this award are actively being sought. Last presented in 2004, the award is now being sponsored by Waters Corp.

Forms for nominations and supporting information as well as a description of ACS national awards are available at chemistry.org/awards. For specific details about the ACS Award in Separations Science & Technology, go to chemistry.org/awards/separations.html. The deadline for receiving nominations for this and other ACS awards to be presented in 2008 is Nov. 1, 2006.

Leonard R. MacGillivray (University of Iowa), **David W. C. MacMillan** (Princeton University), **James A. Marshall** (University of Virginia), **Kenneth J. Shea** (University of California, Irvine), **David A. Tirrell** (California Institute of Technology), **James M. Tour** (Rice University), and **Yoshinori Yamamoto** (Tohoku University, Japan)

Elias J. Corey Award for Outstanding Original Contribution in Organic Synthesis by a Young Investigator sponsored by the Pfizer Endowment Fund, **Michael J. Krische**, University of Texas, Austin

F. Albert Cotton Award in Synthetic Inorganic Chemistry sponsored by the F. Albert Cotton Endowment Fund, **Christopher C. Cummins**, Massachusetts Institute of Technology

Peter Debye Award in Physical Chemistry sponsored by DuPont, **John T. Yates Jr.**, University of Pittsburgh

Frank H. Field & Joe L. Franklin Award for Outstanding Achievement in Mass Spectrometry sponsored by Waters Corp., **Jean H. Futrell**, Pacific Northwest National Laboratory

Francis P. Garvan-John M. Olin Medal sponsored by Francis P. Garvan-John M. Olin Medal Endowment, **Laura L. Kiessling**, University of Wisconsin, Madison

James T. Grady-James H. Stack Award for Interpreting Chemistry for the Public sponsored by ACS, **Stuart F. Brown**

Ernest Guenther Award in the Chemistry of Natural Products sponsored by Givaudan, **Dale L. Boger**, Scripps Research Institute

E. B. Hersberg Award for Important Discoveries in Medicinally Active Products sponsored by Schering-Plough, **John A. Katzenellenbogen**, University of Illinois, Urbana-Champaign

Joel Henry Hildebrand Award in the Theoretical & Experimental Chemistry of Liquids

sponsored by ExxonMobil Research & Engineering, **Keith E. Gubbins**, North Carolina State University

Ralph F. Hirschmann Award in Peptide Chemistry sponsored by Merck Research Laboratories, **Samuel H. Gellman**, University of Wisconsin, Madison

Claude S. Hudson Award in Carbohydrate Chemistry sponsored by National Starch & Chemical, **Pierre Sinaÿ**, École Normale Supérieure, France

E. V. Murphree Award in Industrial & Engineering Chemistry sponsored by ExxonMobil Research & Engineering, **Wolfgang F. Holderich**, University of Technology RWTH-Aachen, Germany

Nakanishi Prize sponsored by Nakanishi Prize Endowment, **Hung-Wen Liu**, University of Texas, Austin

Nobel Laureate Signature Award for Graduate Education in Chemistry sponsored by Mallinckrodt Baker, **Anirban Banerjee** (student), Rockefeller University; **Gregory L. Verdine** (preceptor), Harvard University

James Flack Norris Award in Physical Organic Chemistry sponsored by the Northeastern Section of ACS, **Ben L. Feringa**, University of Groningen, the Netherlands

George A. Olah Award in Hydrocarbon or Petroleum Chemistry sponsored by the George A. Olah Endowment, **Bruce E. Koel**, Lehigh University

Charles Latbrop Parsons Award sponsored by ACS, **S. Allen Heininger**, Monsanto

George C. Pimentel Award in Chemical Education sponsored by Rohm and Haas, **A. Truman Schwartz**, Macalester College

Priestley Medal sponsored by ACS, **George M. Whitesides**, Harvard University

Glenn T. Seaborg Award for Nuclear Chemistry

sponsored by the ACS Division of Nuclear Chemistry & Technology, **Norbert G. Trautmann**, Johannes Gutenberg University, Mainz, Germany

Gabor A. Somorjai Award for Creative Research in Catalysis sponsored by the Gabor A. & Judith K. Somorjai Endowment Fund, **Hans-Joachim Freund**, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin

E. Bright Wilson Award in Spectroscopy, **Michael D. Fayer**, Stanford University

Ahmed Zewail Award in Ultrafast Science & Technology sponsored by the Ahmed Zewail Endowment Fund, **Robin M. Hochstrasser**, University of Pennsylvania

National Fresenius Award sponsored by Phi Lambda Upsilon, the National Honorary Chemical Society, **Phil S. Baran**, Scripps Research Institute. ■

ACS FREQUENTLY REQUESTED NUMBERS

As a service to ACS members, C&EN periodically publishes a list of frequently requested phone numbers.



Unless otherwise noted, first dial (800) 227-5558.

When prompted, dial the extension given in the following list. To contact other offices, dial the 800 number and ask for operator assistance, or visit the ACS website, chemistry.org.

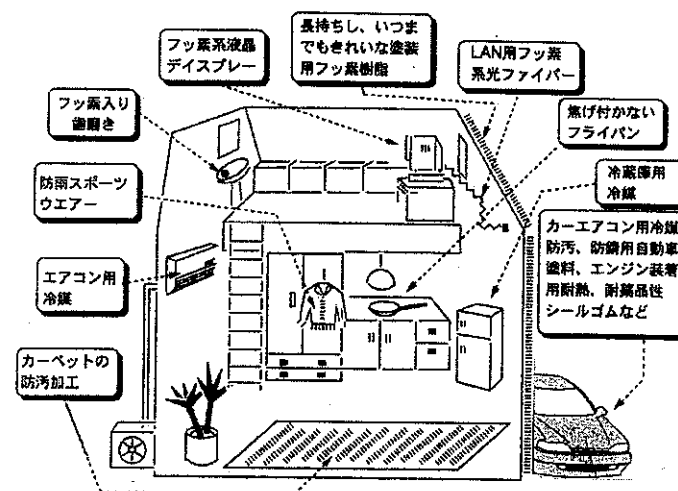
ACS Insurance Plans	2119
ACS PROGRESS Plan	6334
ACS Petroleum Research Fund	6207
ACS Scholars Program	6250
Address changes	(800) 333-9511
Career Services	4432
Chemistry Olympiad	6169
Education, K-12 programs	4382
Education, graduate	6176
Education, undergraduate	4480
Gifts and other products	4600
National Chemistry Week	6097
Legislative & Government Affairs	4386
Local sections	4611
Meetings, national	4396
Meetings, regional	6129
Membership	(800) 333-9511
Publications subscriptions	(800) 333-9511
Records and accounts	(800) 333-9511
Short Courses	4508

魔法の原子フッ素の化学

岡山大学工学部
宇根山健治

1

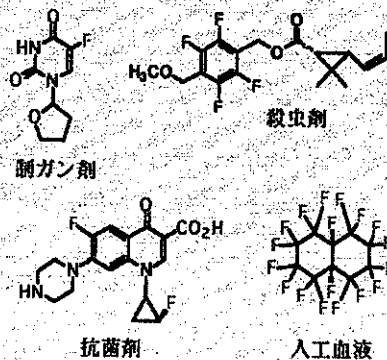
身の周りにあるフッ素製品



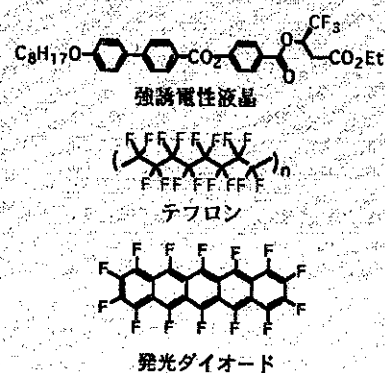
2

人間生活に役立つフッ素化合物

農薬と医薬



特徴ある機能をもった材料

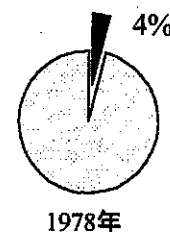


3

フッ素系医薬・農薬の割合

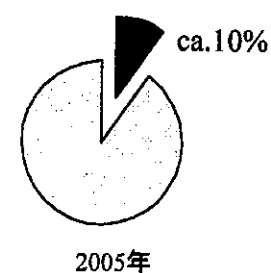
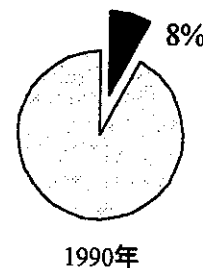
農薬

世界市場
290億ドル
(2000年、±0%)

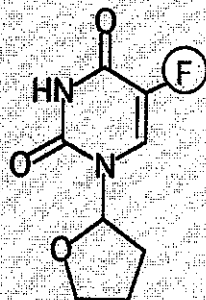


医薬

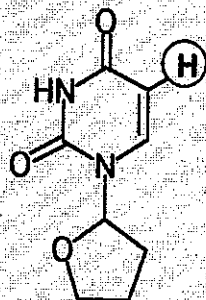
世界市場
6000億ドル
(2005年、+7%)



水素をフッ素に置き換えると効果が出る



制ガン剤



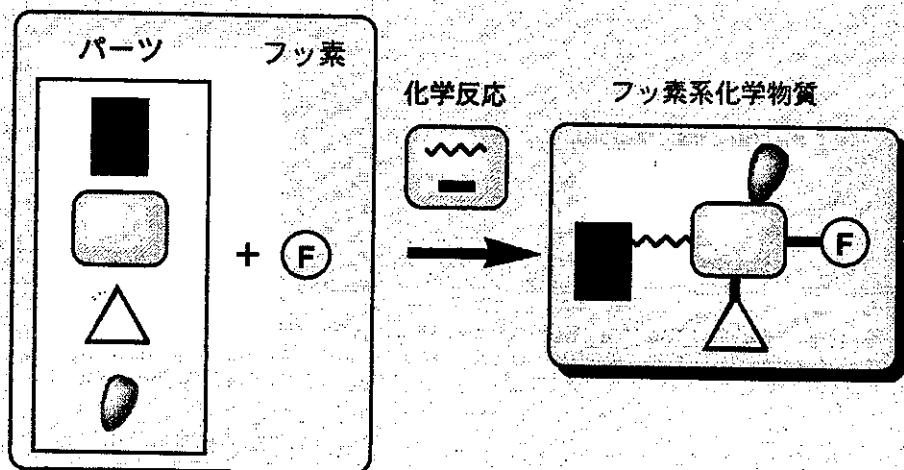
薬効無し

5

いかにしてフッ素系化学
物質を製造するか

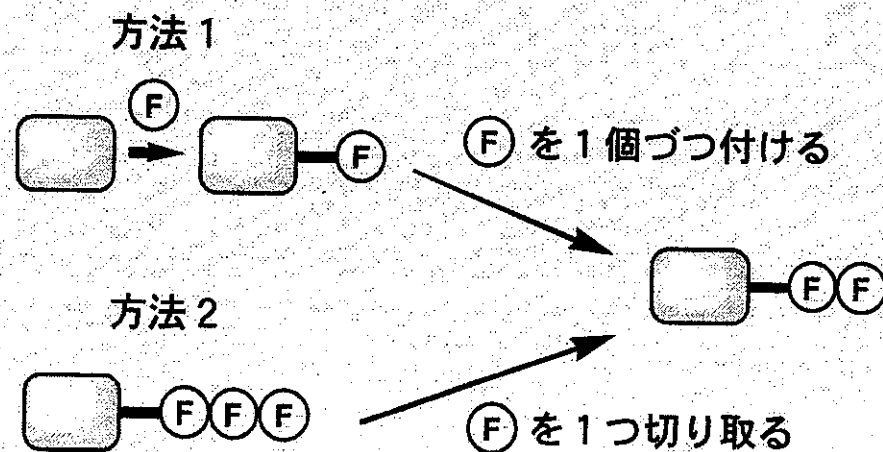
6

フッ素系化学物質の製造



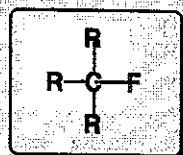
7

フッ素系化学物質の製造



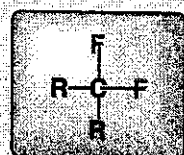
8

市販されているフッ素系化学物質



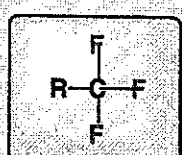
Monofluoro-

製造容易
市販品多数



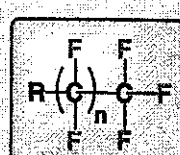
Difluoro-

製造やや困難
市販品極少数



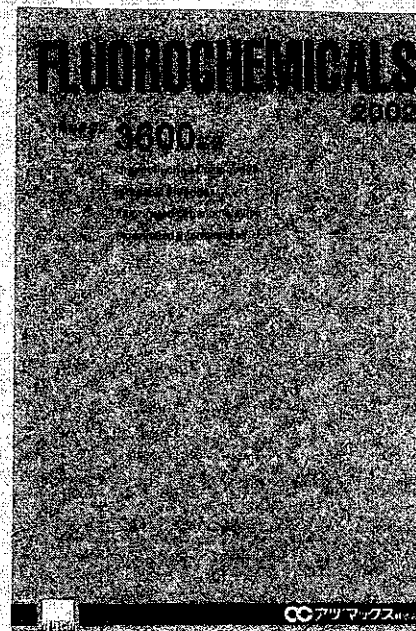
Trifluoro-

製造容易
市販品多数



Perfluoro-

9





Much less availability of (CF₂)-compounds

Among 3,600 items, just a 60 items (< 2 %) are (CF₂)-compounds, others are CF, CF₃ and Rf compounds

10

Some Prices of Commercially Available C F₂ Compounds

CHF ₂ CO ₂ H	1,240,000
CF ₂ ClCO ₂ H	12,3,000
CF ₃ CO ₂ H	28,200

 -OCF ₂ Cl	95,700,000
 -OCF ₃	317,000

CHF ₂ CH ₂ OH	6,340,000
CF ₃ CH ₂ OH	60,500

CHF ₂ CH ₂ NH ₂	10,400,000
CF ₃ CH ₂ NH ₂	3,688,000

円・JY/Kg

11

フッ素系化学物質の製造

方法 1

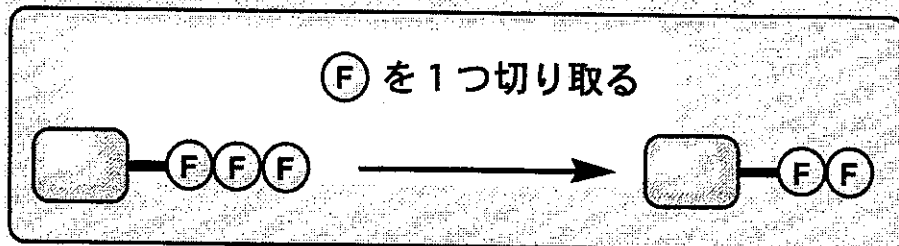


方法 2



12

物質の製造に必要な技術



強い炭素-フッ素結合の切断

13

強い炭素-フッ素結合の切断



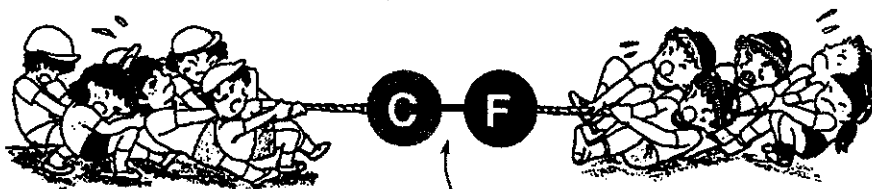
容易ではない

14

炭素-フッ素結合は強いので切るのは難しい

C-F *very strong*
485 kJ/mol
(bond dissociation energy)

(cf. C-H 414 kJ/mol
C-C 347 kJ/mol
C-Cl 339 kJ/mol
C-Br 284 kJ/mol)

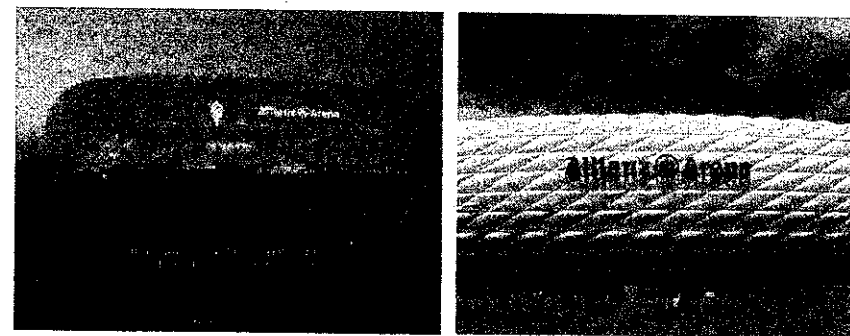


炭素-フッ素結合
を切るのは難しい

15

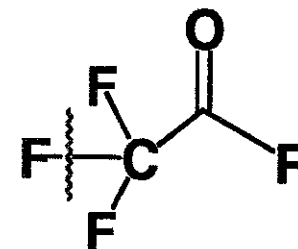
16

Allianz-Arena (フッ素樹脂ETFEフィルム)

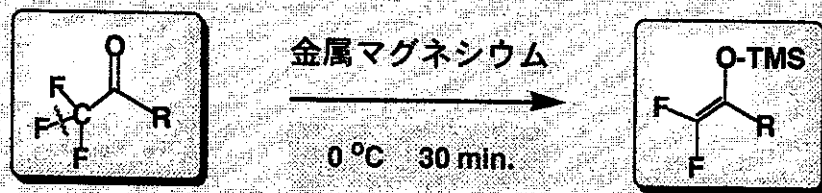


2006 World Soccer Opening Stadium (Munich, Germany)

(収容人員: 67,000)



炭素-フッ素結合の切断による製造法

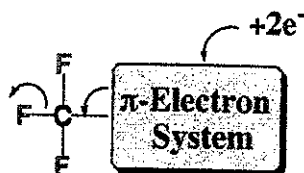


Mg

21

Concept

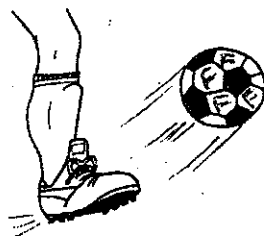
22



23



Not Easy



Easy

24

焦げ付かないフライパン：200度でも切れない



マグネシウムを用いる本方法：0度で切れる



従来の化学的常識を覆した学術的成果
医薬・農薬などフッ素系化学物質の製造への応用に道

本研究に関する特許

(1) 特許3560790

(出願番号：特願平9-298073)、

発明の名称：2，2-ジフルオロエノールシリルエーテルの製造方法

発明者：宇根山 健治、片桐 利真、前田 兼成

(2) 特許3560840

(出願番号：特願平11-030843)

発明の名称：2-トリアルキルシリル2，2-ジフルオロ酢酸エステル
の製造方法

発明者：宇根山 健治、水谷 剛

(3) 特許3560905

(出願番号：特願2000-232572)

発明の名称：2-トリアルキルシリル2，2-ジフルオロ酢酸エステル
の製造方法

発明者：宇根山 健治、網井 秀樹、小林 武史