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Member: Council Member of Science Council of Japan
Executive Member of Council for Science and Technology Policy (Japan)
Provisional Commission of University Division, Central Education Council, MEXT (Japan)

Professor Emeritus: Nagoya University

Academic Carrier

2009-present	Chair Professor	Jing-Cheng Honors College, National Taiwan University of Science and Technology
2008-2009	Professor	Keio Advanced Research Centers, Keio University
2006-2008	Professor	Faculty of Science and Technology, Keio University
1999-2006	Professor	Research Center for Materials Science, Nagoya University
1990-1999	Associate Professor	Department of Chemistry, Faculty of Science, Nagoya University
1975-1990	Research Assistant	Department of Chemistry, Faculty of Science, Nagoya University
1969-1975	Technical Assistant	Department of Chemistry, Faculty of Science, Nagoya University
1965-1969	Technical Assistant	Institute of Protein Research, Osaka University

Awards

1999	Promising Scientist Award of The Society of Japanese Women Scientists
2000	Award of The Japan Oil Chemists' Society
2006	Award of The Achievement for The Polymer Society of Japan

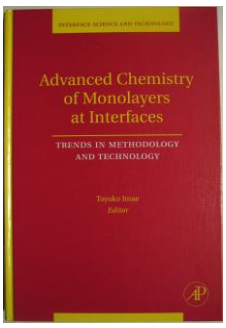
Honors

1993-present	Editorial Advisory Board: Langmuir
2003-present	Editorial Advisers: Journal of Surface Science and Technology

Research Field
Nanoscience/nanotrchnology, polymer science, environmental science

Research subject
Fabrication and functionality of nanoparticles and nanomaterials
Physicochemical properties and applications of dendritic polymers and block copolymers
Construction and characterization of molecular assemblies in solutions and at interfaces

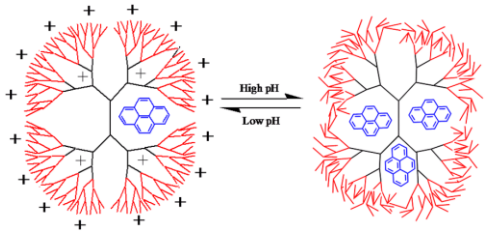
[New Book]
"Advanced Chemistry of Monolayers at Interfaces
- Trends in Methodology and Technology -"
Interface Science and Technology (Series Editor: Arthur Hubbard) - Vol. 14
Publisher: Elsevier Science Publishers, Amsterdam,
Editor: Toyoko Imae
Authors: Andra Dedinaite (Sweden), Robert C. Dunn (USA),
H. Fukumura (Japan), Toyoko Imae (Japan), Wolfgang Knoll (Germany),
Marie Pierre Krafft (France), Roger M. Leblanc (USA), Yukihiro Ozaki (Japan),
J. Penfold (UK), Osamu Takai (Japan), Atsushi Takahara (Japan), Hitoshi Watarai (Japan)



[Topics of Researches]

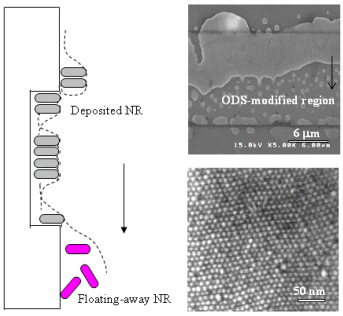
247) pH Dependent Encapsulation of Pyrene in PPI-core:PAMAM-shell Dendrimers, Dinakaran Kannaiyan and Toyoko Imae, Langmuir, 2009, 25, 5282-5285

Core-shell dendrimers consisting of poly(propyleneimine) (PPI) dendrimer as a core and poly(amido amine) (PAMAM) dendrons as a shell have been synthesized through the route of Michael addition reaction followed by amidation. These macromolecules were investigated their ability to solubilize a guest molecule, pyrene. Number of encapsulated pyrene molecules per dendrimer increased with pH of a solution and generation (G) of PAMAM dendron, and it reached 2.7 for PPI(G3)-core:PAMAM(G3)-shell dendrimer at pH 11. It was confirmed that the solubilized pyrene located in the hydrophobic nanocavities of the PPI dendrimer core in the dendrimer. The shrunk PAMAM dendron shell should play a role of retention fence of doped molecules.



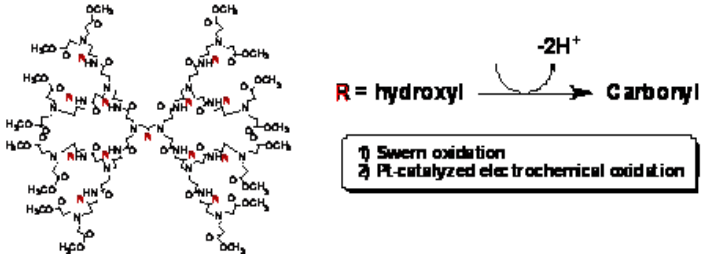
246) Perpendicular Superlattice Growth of Hydrophobic Gold Nanorods on Patterned Silicon Substrates via Evaporation-induced Self-assembling, Xiaoming Zhang and Toyoko Imae, J. Phys. Chem. C, 2009, 113, 5947-5951

A simple and efficient route has been reported for perpendicular superlattice self-assembling of hydrophobic gold nanorods (NRs) based on solvent evaporation. The combination of top-down surface patterning and bottom-up material assembling was used for leading to area-selective gold NR superlattice. The superlattice preferably deposited with perpendicular orientation of gold NRs on the hydrophobic stripe region in the patterned substrate. The superlattice occupied broad areas up to several square millimeters and possessed an uppermost surface of hexagonally close-packed NR monolayer.



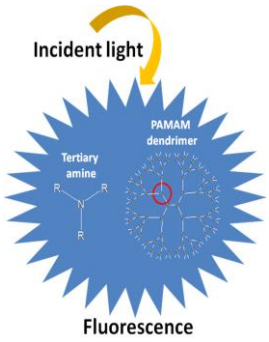
245) Synthesis of Poly(amido amine) Dendrimer with Redox-Active Spacers, Chih-Chien Chu and Toyoko Imae, Macromolecules, 2009, 42, 2295-2299

We have demonstrated a newly synthetic route for the preparation of internally modified PAMAM dendrimers. The functional diamines were synthetically embedded as the linking spacer through the amidation process on the divergent construction of dendrimer. NMR analyses supported the covalent incorporation of multiple IPA moieties inside the dendrimer by the appearance of carbon and proton signals on the secondary alcohol, and post-acetylation was also successfully carried out to confirm the existence of these internal hydroxyl functionalities. Moreover, based on the oxidation capability of IPA into corresponding ketone through dehydrogenation process, spacer-modified dendrimer successfully demonstrated a redox-active property by either chemical or electrochemical oxidation method. Potentially, one spacer-modified PAMAM dendrimer molecule can be regarded not only as the “fuel carrier”, containing multiple IPA molecules, but also as the “hydrogen donor” for further applications such as fuel cells and biosensors.



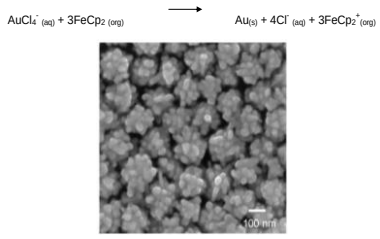
243) Fluorescence investigations of oxygen-doped simple amine; in comparison with fluorescent PAMAM dendrimer, Chih-Chien Chu and Toyoko Imae, Macromol. Rapid Commun., 2009, 16, 89-93

Blue emission of oxygen-doped tertiary amine (triethylamine), a key unit of fluorescent poly(amido amine) dendrimer, was first demonstrated. It was found that the fluorescence intensity could be more enhanced, if the tertiary amines locate densely in the dendrimer interior as the branching sites. Moreover, a solvatochromic phenol blue (PB) instead of oxygen is able to induce the blue fluorescence of the tertiary amino-branching sites based on a guaranteed host-guest complexation of PB molecules and dendrimer interior.



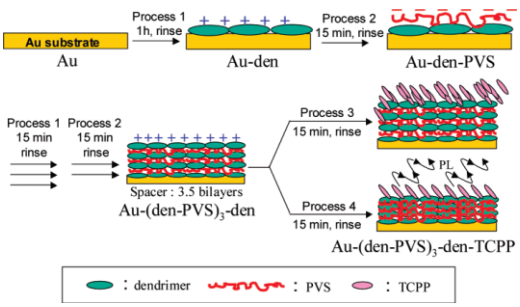
239) Synthesis of Confeito-Like Gold Nanostructures by a Solution Phase Galvanic Reaction, Jadab Sharma, Yian Tai, and Toyoko Imae, J.Phys.Chem. C, 2008, 112, 17033-17037

Anisotropic gold nanostructures with multiple cones have been synthesized by a solution phase galvanic reaction. The nanostructures are uniform in shape and size (maximum diameter: ~ 300 nm, body diameter: 100 - 150 nm, cone diameter: ~ 30 nm, and cone length: 20 - 40 nm), and they consist of single crystalline structure. A UV-visible spectrum of these nanostructures shows surface plasmon bands at 320, 415, 530 nm, and a broad absorption band around 950 nm, in which the latter is observed for large anisotropic gold nanostructures. A strong surface enhanced Raman scattering effect was also observed for the nanostructures on substrates using Rhodamine 6G as a probe molecule.



235) Surface Plasmon Fluorescence Investigation of Energy Transfer-controllable Organic Thin Films, Langmuir, Koji Mitamura, Toyoko Imae, Senjun Tian and Wolfgang Knoll, Langmuir, 2008, 24, 2266-2270

Thin functional organic films on a gold substrate were fabricated by adsorbing tetrakis(carboxyphenyl)porphyrin (TCPP) on a spacer layer, which was prepared by the layer-by-layer adsorption of a dendrimer and a linear polymer. The thickness and photoluminescence of the films were investigated by surface plasmon resonance and surface plasmon fluorescence techniques, respectively. TCPP adsorbed on the spacer layer in aqueous solutions of different ionic strengths resulted in a thick TCPP adlayer at high ionic strength and a shrunk spacer layer at low ionic strength. The fluorescence was quenched at high ionic strength but could be observed at low ionic strength. The effects are explained by the states of dye aggregation. This study shows the control of energy transfer from a metal surface to a dye layer by changing the dye adlayer. It can contribute to the development of molecular devices involving energytransfer systems.



Publications (only English, extract, since 2004)

[Editor and author]

19) "Advanced Chemistry of Monolayers at Interfaces – Trends in Methodology and Technology –" Ed. by Toyoko Imae, Elsevier Science Publishers, Amsterdam, 2007

18) Homo- and Hybrid-Monolayers of Dendritic Polymers in "Advanced Chemistry of Monolayers at Interfaces – Trends in Methodology and Technology –" Toyoko Imae, Masaki Ujihara, and Mariko Hayashi, Ed. by T. Imae, Chapter 9, 219-245, 2007.

15) Functionalities of Dendrimers in "Encyclopedia of Nanoscience and Nanotechnology" Toyoko Imae, Katsuya Funayama, Yuko Nakanishi, and Kenkichi Yoshii, Ed. By H. S. Nalwa, American Scientific Pub., Stevenson Ranch, Chapter 3, 685-701, 2004.

[paper]

247) pH Dependent Encapsulation of Pyrene in PPI-core:PAMAM-shell Dendrimers, Dinakaran Kannaiyan and Toyoko Imae, Langmuir, 2009, 25, 5282-5285

246) Perpendicular Superlattice Growth of Hydrophobic Gold Nanorods on Patterned Silicon Substrates via Evaporation-induced Self-assembling, Xiaoming Zhang and Toyoko Imae, J. Phys. Chem. C, 2009, 113, 5947-5951

245) Synthesis of Poly(amido amine) Dendrimer with Redox-Active Spacers, Chih-Chien Chu and Toyoko Imae, Macromolecules, 2009, 42, 2295-2299

244) Functionalization of Gold Nanorods toward Their Applications, Koji Mitamura and Toyoko Imae, Plasmonics, 2009, 4, 23-30 (review)

243) Fluorescence investigations of oxygen-doped simple amine; in comparison with fluorescent PAMAM dendrimer, Chih-Chien Chu and Toyoko Imae, Macromol. Rapid Commun., 2009, 16, 89-93

242) Surface Modification of Gold Nanorods by Organosilanes, Koji Mitamura, Toyoko Imae, Nagahiro Saito, and Osamu Takai, Composite Interfaces, 2009, 16, 377-385

241) Fabrication of dendrimer porogen-capsulated mesoporous silica via sol-gel process of silatrane precursor, Walairat Tanglumlert, Sujitra Wongkasemjit, and Toyoko Imae, J. Nanosci. Nanotech., 2009, 9, 1844-1850

240) Recent Advances in Fabrication of Anisotropic Metallic Nanostructures, Jadab Sharma and Toyoko Imae, J. Nanosci. Nanotechnol. 2009, 9, 19-40 (Review)

239) Synthesis of Confeito-Like Gold Nanostructures by a Solution Phase Galvanic Reaction, Jadab Sharma, Yian Tai, and Toyoko Imae, J.Phys.Chem. C, 2008, 112, 17033-17037

238) Preparation of highly ordered Fe-SBA-1 and Ti-SBA-1 cubic mesoporous silica via sol-gel processing of silatrane, Walairat Tanglumlert, Toyoko Imae, Timothy John White, Sujitra Wongkasemjit, Materials Letters, 2008, 62, 4545-4548

237) Investigation of luminescent poly(propylene imine) dendrimer, Kana Tamano and Toyoko Imae, J. Nanosci. Nanotech. 2008, 8, 4329-4334

236) Synthesis and Characterization of Poly(ethyleneimine) Dendrimers, Omprakash Yemul and Toyoko Imae, Colloid and Polymer Science, 2008, 286, 747-752

235) Surface Plasmon Fluorescence Investigation of Energy Transfer-controllable Organic Thin Films, Langmuir, Koji Mitam**u**ra, Toyoko Imae, Senjun Tian and Wolfgang Knoll, Langmuir, 2008, 24, 2266-2270

234) Solid-phase Synthesis of Amphiphilic Dendron-Surface Modified Silica Particles and Their Application Toward Water Purification, Chih-Chien Chu, Norio Ueno and Toyoko Imae, Chem. Mater., 2008, 20, 2669-2676

233) Transport properties of field-effect transistor with Langmuir-Blodgett films of C60 dendrimer and estimation of impurity levels, Naoko Kawasaki, Takayuki Nagano, Yoshihiro Kubozono, Yuuki Sako, Yuu Morimoto, Yutaka Takaguchi, Akihiko Fujiwara, Chih-Chien Chu, and Toyoko Imae Applied Physics Letters,. 2007, 91, 243515-1-243515-3

232) Fabrication and Structure of Alginate Gel Incorporating Gold Nanorods, Koji Mitamura; Toyoko Imae; Nagahiro Saito; Osamu Takai, J. Phys. Chem. C, 2008, 112, 416-422

231) Structural aspects of SBA-1 cubic mesoporous silica synthesized via a sol-gel process using silatrane precursor, walairat tanglumlord, Toyoko Imae, Timothy John White, and Sujitra Wongkasemjit, J. Am.

Ceramic Soc., 2007, 90, 3992-3997
230) Fabrication and Self-Assembly of Hydrophobic Gold Nanorods, Koji Mitamura, Toyoko Imae, Nagahiro Saito, and Osamu Takai, J. Phys. Chem. B, 2007, 111, 8891-8898
229) Dendrimer-mediated Synthesis of Water-dispersible Carbon Nanotube-supported Oxide Nanoparticles, Xing Lu and Toyoko Imae, J. Phys. Chem. C, 111, 2007, 8459-8462
228) Size-controlled *In Situ* Synthesis of Metal Nanoparticles on Dendrimer-Modified Carbon Nanotubes, Xing Lu and Toyoko Imae, J. Phys. Chem. C, 2007, 111, 2416-2420
227) Photochemical synthesis of crown-shaped platinum nanoparticles using aggregates of G4-NH_2 PAMAM dendrimer as templates, Xuzhong Luo and Toyoko Imae, J. Mater. Chem., 2007, 17, 567 – 571
226) Shape-Controlled Synthesis of Gold Nanoparticles Under UV irradiation in the Presence of Poly(Ethylene Glycol), Xuzhong Luo and Toyoko Imae, Current Nanoscience (CNANO), 2007, 3, 195-198
225) Fluorescence Quenching of 3,7-diamino-2,8-dimethyl-5-phenyl Phenazinium Chloride by AgCl and Ag Nanoparticles, Smritimoy Pramanik, Subhash Chandra Bhattacharya, and Toyoko Imae, Journal of Luminescence, 2007, 126 155-159
224) Fluorescence Emission from PAMAM and PPI Dendrimers, Dongjun Wang, Toyoko Imae, and Masao Miki, J. Colloid Interface Science, 2007, 307, 354-360
221) Watching the Transformation from Au Nanoparticles to Microplates, Dongjun Wang and Toyoko Imae, Chem. Lett., 2006, 35, 1152-1153
220) Direct observation of swollen microgel particles by FF-TEM, Isamu Kaneda, Atsushi Sogabe, and Toyoko Imae, J. Advanced Science, 2006, 18, 1-2 (Silver Prize)
219) Single-line EPR Spectra from Radicals Encapsulated in Aggregates of Amphiphilic Block Copolymers with Hydrophobic Dendritic Pendants in Water, Kana Tamano, Toshiyuki Tanaka, Kunio Awaga, Toyoko Imae, Shin-ichi Yusa, and Yoshihiko Shimada, Macromol. Rapid Commun. 2006, 27, 1764-1768
217) Fabrication of Metal Nanoparticle Monolayers on Amphiphilic Poly(amido amine) Dendrimer Langmuir Films, Masaki Ujihara, Koji Mitamura, Naoya Torikai and Toyoko Imae, Langmuir, 2006, 22, 3656-3661
216) Dendritic nano- and microhydrogels fabricated by triethoxysilyl focal dendrons, Daisuke Onoshima and Toyoko Imae, Soft Matter, 2006, 2, 141-148
215) Self-assembled Monolayer of Carboxyl-terminated Poly(amido amine) Dendrimer, Masahiro Ito and Toyoko Imae, J. Nanosci. Nanotech., 2006, 6, 1667-1672
214) Preparation of Siloxy Focal Dendron-protected TiO_2 Nanoparticles and Their Photocatalysis, Yuko Nakanishi and Toyoko Imae, J, Colloid Interface Sci., 2006, 297, 122-129
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212) Structural and Morphological Changes of Monolayers of a Block Copolymer with Dendron and Perfluoroalkyl Side Chains by Mixing an Perfluorooctadecanoic Acid, Koji Mitamura, Toyoko Imae, Emiko Mouri, Naoya Torikai, Hideki Matsuoka, and Tetsuya Nakamura, J. Nanosci. Nanotech., 2006, 6, 36-42
211) Adsorption Behaviors of Poly(amido amine) Dendrimers with an Azacrown Core and Long Alkyl Chain Spacers on Solid Substrates, Masaki Ujihara and Toyoko Imae, J. Colloid Interface Sci., 2006, 293, 333-341
210) Photolithographic Patterning of Dendrimer Monolayers and Pattern-selective Adsorption of Linear Macromolecules, Tomoko Yamazaki, Toyoko Imae, Hiroyuki Sugimura, Nagahiro Saito, Kazuyuki Hayashi and Osamu Takai, J. Nanosci. Nanotech., 2005, 5, 1792-1800
209) Covalent-bonded Immobilization of Lipase on Poly(phenylene sulfide) Dendrimers and Their Hydrolysis Ability, Omprakash Yemul, and Toyoko Imae, Biomacromolecules, 2005, 6, 2809-2814
208) Synthesis of Mesoporous Iron Phosphate Using PAMAM Dendrimer as a Single Molecular Template, Xuzhong Luo and Toyoko Imae, Chem. Lett. 2005, 34, 1132-1133
207) Film Structures of Poly(amido amine) Dendrimers with an Azacrown Core and Long Alkyl Chain Spacers on Water or Ag Nanoparticle Suspension, Masaki Ujihara, Jhony Orbulescu, Toyoko Imae and Roger M. Leblanc, Langmuir, 2005, 21, 6846-6854
206) Fabrication and Luminescent Properties of Silver Nanoparticles Passivated by Fullerodendrons, Chisato Hirano, Toyoko Imae, Mitsuhiro Tamura, Yutaka Takaguchi, Chem. Lett., 2005, 34, 862-863
205) Morphological Dependence of Fluorescence Emitted from PbS/PAMAM Dendrimer Nanocomposite, Dongjun Wang and Toyoko Imae, Chem. Lett., 2005, 34, 640-641
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SAM, Tomoko Yamazaki and Toyoko Imae, J. Nanosci. Nanotech., 2005, 5, 1066-1071
203) Polysaccharides as a Template for Silicate Generated by the Sol-gel Processes, Yurii A. Shchipunov, Akiyo Kojima, and T. Imae, J. Colloid Interface Sci. 2005, 285, 574-580
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201) Synthesis of Dendrimer-protected TiO_2 Nanoparticles and Photodegradation of Organic Molecule in an Aqueous Nanoparticle Suspension, Yuko Nakanishi and Toyoko Imae, J, Colloid Interface Sci., 2005, 285, 158-162
200) Structure-selective Dye-uptake into Aggregate of Copolymer with Linear Polyelectrolyte Block and Hydrophobic Block Carrying Pendant Dendritic Moiety in Water, Kana Tamano, Toyoko Imae, Shin-ichi Yusa, and Yoshihiko Shimada, J. Phys. Chem. B, 109, 1226-1230 (2005).
199) Synthesis and Film Formation of Poly(phenylene Sulfide) Dendrimers and Dendrons, Omprakash Yemul, Masaki Ujihara, Norio Miki, and Toyoko Imae, Polymer J., 37, 82-93 (2005).
198) Fabrication and Properties of Fullerodendron Thin Films, Chisato Hirano, Toyoko Imae, Shohoko Fujima, Yasushi Yanagimoto, and Yutaka Takaguchi, Langmuir, 21, 272-279 (2005).
197) Fluorescence Emission from Dendrimers and Its pH Dependence, Dongjun Wang and Toyoko Imae, J. Am. Chem. Soc., 126, 13204 –13205 (2004).
196) Morphological Investigation of Hybrid Langmuir-Blodgett Films of Arachidic Acid with a Hydrotalcite/Dendrimer Nanocomposite, Alexsandro Santos Costa and Toyoko Imae, Langmuir, 20, 8865-8869 (2004).
195) Electrochemical Properties of Protoporphyrin IX Zinc (II) Films, Chisato Hirano and Toyoko Imae, J. Colloid Interface Sci. 280, 478-483 (2004).
194) A Generalized Scale of Free Energy of Excess Adsorption of Solute and Absolute Composition of the Interfacial Phase, Dipti Kumar Chattoraj, Toyoko Imae, and Atanu Mitra, Langmuir, 20, 4903-4915 (2004)
193) Synthesis and characterization of nanoporous silica using Dendrimer Molecules, Atanu Mitra, Asim Bhaumik and Toyoko Imae, J. Nanosci. Nanotech., 14, 1052-1055 (2004)
192) A Novel Approach for the Preparation of Silver-silica Nanocomposite, Atanu Mitra and Toyoko Imae, Chem. Lett. 930, 930-931 (2004)
190) Self-association of Water-soluble Fluorinated Diblock Copolymers in Solutions, Hiroshi Ito, Toyoko Imae, Tetsuya Nakamura, Motoyuki Sugiura and Yoshihiro Oshibe, J. Colloid Interface Sci. 276, 290-298 (2004).
189) Electrochemical and Optical Properties of the Poly(3,4-ethylenedioxythiophene) Film Electropolymerized in an Aqueous Sodium Dodecyl Sulfate and Lithium Tetrafluoroborate Medium, Chun Li and Toyoko Imae, Macromolecules, 37, 2411-2416 (2004).
188) Intercalation of Dendrimers in the Interlayer of Hydrotalcite Clay Sheets, Alexsandro Santos Costa, Toyoko Imae , Katsuhiko Takagi, and Koichi Kikuta, Progr. Colloid Polym. Sci., 128, 113-119 (2004).
187) Association of Block Copolymers with Dendritic and Perfluorinated Side Chains in Solution and at Interface, Makiko Takahashi, Shinichi Hamaguchi, Hiroshi Ito, Toyoko Imae, and Tetsuya Nakamura, Progr. Colloid Polym. Sci., 128, 68-73 (2004).
186) Complexation of Dendrimer-protected Silver Nanoparticles with Hydrotalcite, Alexsandro Santos Costa and Toyoko Imae, Trans. Mater. Res. Soc. Jpn., 29, 3211-3214 (2004).
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184) Synthesis and Characterization of Novel Azacrown Core Dendrimers and Functional Dendrons with Long Alkyl Chain Spacers, Omprakash Yemul, Masaki Ujihara and Toyoko Imae, Trans. Mater. Res. Soc. Jpn., 29, 165-168 (2004).
183) Nanogel Formation Consisting of DNA and Poly(amido amine) Dendrimer Studied by Static Light Scattering and Atomic Force Microscopy, Atanu Mitra and Toyoko Imae, Biomacromolecules, 5, 69-73 (2004).
182) Structural Evolution of an Interpolyelectrolyte Complex of Charged Dendrimers Interacting with Poly(L-glutamate), Dietrich Leisner and Toyoko Imae, J. Phys. Chem. B, 108, 1798-1804 (2004).