

Curriculum Vitae

Prof. Dr. Hidemitsu Furukawa

Personal Information:

Last name: *Hidemitsu*
First name: *Furukawa*
Gender: *Male*
Birthday: *December 7, 1968 (Born in Tokyo, Japan)*
Nationality: *Japanese*



Current Position:

Principal Investigator of Soft & Wet Matter Engineering Lab (SWEL)
Chair of Life-3D Printing Innovation Center (LPIC)
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Education:

1968 Born in Tokyo, Japan.
1991 B. Sc., Saitama University, Japan.
1993 M. Sc. and 1996 Ph. D., Tokyo Institute of Technology. My academic supervisor was Prof. Sunshuke HIROTSU.

Professional Experience and award:

1996-2002 Assistant Professor of Prof. Takuhei NOSE and Associate Prof. Mamoru OKADA, Department of Engineering of Polymer Chemistry, Tokyo Institute of Technology
2002-2004 Assistant Professor of Prof. Kazuyuki HORIE and Associate Prof. Toshiyuki WATANABE, Department of Engineering of Polymer Materials and Chemistry, Tokyo University of Agriculture and Technology
2004-2009 Associate professor of Prof. Yoshihito OSADA and Prof. Jian Ping GONG, Division of Life Sciences, Hokkaido University
2009-2012 Independent Associate professor, Department of Mechanical Systems Engineering, Yamagata University
2012- Full Professor, Department of Mechanical Systems Engineering, Yamagata University

2004 Excellent Young Researcher (YR-II) in Center of Excellence Program in Tokyo University of Agriculture and Technology
2010 Intensive Presentation Award in M&M International Symposium for Young Researchers (The Japanese Society of Mechanical Engineers)
2010 Award from Association for the Advancement of Scientific Measurement (Tohoku University)
2013 Nice-Step Researcher (National Institute of Science and Technology Policy (NISTEP), Japan)

Society:

The Japanese Society of Mechanical Engineers (JSME), The American Society of Mechanical Engineers (ASME), The Society of Polymer Science, Japan, The Physical Society of Japan, The Chemical Society of Japan, American Chemical Society, The Society of Rheology, Japan, The Cellulose Society of Japan, The Society of Rubber Science and Technology, Japan, Japanese Society of Tribologists, Japanese Society of Biorheology, The Electrochemical Society (ECS)

Research Interest:

Original Papers:

- 1) S. Hirotsu, I. Yamamoto, A. Matsuo, T. Okajima, H. Furukawa, T. Yamamoto, “Brillouin Scattering Study of the Volume Phase Transition in Poly-N-Isopropylacrylamide Gels”, *J. Phys. Soc. Jpn.*, **64**(8), 2898-2907 (1995)
- 2) H. Furukawa, “Effect of varying preparing concentration in polyacrylamide gels on equilibrium swelling behavior”, *J. Mol. Struct.*, **554**, 11-19 (2000)
- 3) M. Okada, H. Masunaga, H. Furukawa, “Concentric Pattern Formation during Phase Separation Induced by a Cross-Linking Reaction”, *Macromolecules*, **33**(20), 7238-7240 (2000)
- 4) H. Furukawa, S. Hirotsu, “Dynamic Light Scattering from Static and Dynamic Fluctuations in Inhomogeneous Media”, *J. Phys. Soc. Jpn.*, **71**(12), 2873-2880 (2002)
- 5) J. He, S. Machida, H. Kishi, H. Furukawa, K. Horie, R. Yokota, “Preparation of Novel High Modulus Swollen or Jungle-gym Type Polyimide Gels End-crosslinked with Tris(4-aminophenyl)benzene”, *J. Polym. Sci: Part A: Polym. Chem. Ed.*, **40**(14), 2501-2512 (2002)
- 6) H. Furukawa, K. Horie, R. Nozaki, M. Okada, “Swelling Induced Modulation of Static and Dynamic Fluctuations in Polyacrylamide Gels Observed by Scanning Microscopic Light Scattering”, *Phys. Rev. E*, **68**, 031406-1-14 (2003)
- 7) K. Horie, S. Murase, S. Takahashi, M. Teramoto, H. Furukawa, “Photochemically-Induced Refractive Index and Fluorescence Patterning on Polymer Films”, *Macromol. Symp.*, **195**, 201-208 (2003)
- 8) T. Tanabe, H. Furukawa, M. Okada, “Salami Pattern Formation during Phase Separation Induced by Polymerization of 2-Chlorostyrene in the Presence of Polystyrene”, *Polymer*, **44**, 4765-4768 (2003)
- 9) S. Murase, M. Teramoto, H. Furukawa, Y. Miyashita, K. Horie, “Photochemically Induced Fluorescence Control with Intermolecular Energy Transfer from a Fluorescent Dye to a Photochromic Diarylethene in a Polymer Film”, *Macromolecules*, **36**(4), 964-966 (2003)
- 10) S. Murase, K. Shibata, H. Furukawa, Y. Miyashita, K. Horie, “Large Photoinduced Refractive Index Increase in Polymer Films Containing Phenylazide Maintaining Their Transparency and Thermal Stability”, *Polym. J.*, **35**(2), 203-207 (2003)
- 11) Y. Nishio, A. Yamada, K. Ezaki, Y. Miyashita, H. Furukawa, K. Horie, “Preparation and magnetometric characterization of iron oxide-containing alginate/poly(vinyl alcohol) networks”, *Polymer*, **45**, 7129-7136 (2004)
- 12) M. Okada, G. Inoue, T. Ikegami, K. Kimura, H. Furukawa, “Composition dependence of polymerization-induced phase separation of 2-chlorostyrene/polystyrene mixtures”, *Polymer*, **45**, 4315-4321 (2004)
- 13) Y. Matsushita, H. Furukawa, M. Okada, “Crystal-Like Pattern Formation in Polymerization-Induced Phase Separation”, *Phys. Rev. E.*, **70**, 040501(R)-1-3 (2004)
- 14) A. Maestro, D. P. Acharya, H. Furukawa, J. M. Gutierrez, M. A. Lopez-Quintela, M. Ishitobi, H. Kunieda, “Formation and Distribution of Viscoelastic Wormlike Micellar Networks in the Mixed Surfactant Systems of Sucrose Alkanoate and Polyoxyethylene Alkyl Ether”, *J. Phys.*

Chem. B, **108**, 14009-14016 (2004)

- 15) T. Kurokawa, T. Tominaga, Y. Katsuyama, R. Kuwabara, H. Furukawa, Y. Osada, J. P. Gong, "Elastic-Hydrodynamic Transition of Gel Friction", *Langmuir*, **21**, 8643-8648 (2005)
- 16) H. Tsukeshiba, M. Huang, Y. H. Na, T. Kurokawa, R. Kuwabara, Y. Tanaka, H. Furukawa, Y. Osada, J. P. Gong, "Effect of Polymer Entanglement on the Toughening of Double Network Hydrogels", *J. Phys. Chem. B*, **109**, 16304-16309 (2005)
- 17) E. Yoshinari, H. Furukawa, K. Horie, "Fluorescence study on the mechanism of rapid shrinking of grafted poly(*N*-isopropylacrylamide) gels and semi-IPN gels", *Polymer*, **46**, 7741-7748 (2005)
- 18) X. Wang, M. Okada, Y. Matsushita, H. Furukawa, C. C. Han, "Crystal-like array formation in phase separation induced by radical polymerization", *Macromolecules*, **38**, 7127-7133 (2005)
- 19) Y. Shigekura, Y. M. Chen, H. Furukawa, T. Kaneko, D. Kaneko, Y. Osada, J. P. Gong, "Anisotropic Polyion-complex Gels via Template Polymerization", *Advanced Materials*, **17**, 2695-2699 (2005)
- 20) N. Anzai, H. Kurihara, M. Sone, H. Furukawa, T. Watanabe, K. Horie, S. Kumar, "Light-induced Formation of Curved Needle Texture by Circular Polarized Light Irradiation on a Discotic Liquid Crystal Containing a Racemic Chromium Complex", *Liquid Crystal*, **33**, 671-679 (2006)
- 21) N. Naga, E. Oda, A. Toyota, K. Horie, H. Furukawa, "Tailored synthesis and fundamental characterization of organic-inorganic hybrid gels from siloxane or silsesquioxane building blocks and ω -nonconjugated dienes by means of hydrosilylation reaction", *Macromol. Chem. Phys.*, **207**, 627-635 (2006)
- 22) Y.-H. Na, Y. Tanaka, Y. Kawauchi, H. Furukawa, T. Sumiyoshi, J. P. Gong, Y. Osada, "Necking Phenomenon of Double-Network Gels", *Macromolecules (Communication to the Editor)*, **39**(14), 4641-4645 (2006)
- 23) H. J. Kwon, Y. Tanaka, A. Kakugo, K. Shikinaka, H. Furukawa, Y. Osada, J. P. Gong, "Anisotropic Nucleation Growth of Actin Bundle: A Model for Determining the Well-Defined Thickness of Bundles", *Biochemistry*, **45**, 10313-10318 (2006)
- 24) A. Ohsugi, H. Furukawa, A. Kakugo, Y. Osada, J. P. Gong, "Catch and Release of DNA in Coacervate-Dispersed Gels", *Macromol. Rapid Commun.*, **27**, 1242-1246 (2006)
- 25) H. Furukawa, M. Kobayashi, Y. Miyashita, K. Horie, "End-Crosslinking Gelation of Poly(amide acid) Gels studied with Scanning Microscopic Light Scattering", *High Perform. Polym.*, **18**, 837-847 (2006)
- 26) K. Kawagishi, H. Saito, H. Furukawa, K. Horie, "Superior Nanoporous Polyimides via Supercritical CO₂ Drying of Jungle-gym Type Polyimide Gels", *Macromol. Rapid Commun.*, **28**, 96-100 (2007)
- 27) H. J. Kwon, K. Shikinaka, A. Kakugo, H. Furukawa, Y. Osada, J. P. Gong, "Growth and Morphology of Polymer-Actin Complexes", *Chinese J. Polym. Sci.*, **25**, 47-55 (2007).
- 28) H. J. Kwon, K. Shikinaka, A. Kakugo, H. Furukawa, Y. Osada, J. P. Gong, "Motility and Structural Polymorphism of Polymer-Actin Complex Gel", *J. Nanosci. Nanotechnol.*, **7**, 844-847 (2007)

- 29) Y. Shigekura, H. Furukawa, W. Yang, Y. M. Chen, T. Kaneko, Y. Osada, J. P. Gong, "Anisotropic Gelation Seeded by a Rod-Like Polyelectrolyte", *Macromolecules*, **40**, 2477-2485 (2007)
- 30) M. Huang, H. Furukawa, Y. Tanaka, T. Nakajima, Y. Osada, J. P. Gong, "Importance of Entanglement between First and Second Components in High-Strength Double Network Gels", *Macromolecules*, **40**, 6658-6664 (2007)
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- 33) M. Du, Y. Maki, T. Tominaga, H. Furukawa, J. P. Gong, Y. Osada, Q. Zheng, "Friction of Soft Gel in Dilute Polymer Solution", *Macromolecules*, **40**(12), 4313-4321 (2007)
- 34) N. Naga, E. Oda, A. Toyota, H. Furukawa, "Mesh Size Control of Organic-Inorganic Hybrid Gels by Means of a Hydrosilylation Co-gelation of Siloxane or Silsesquioxane and ω -Nonconjugated Dienes", *Macromol. Chem. Phys.*, **208**(21), 2331-2338 (2007)
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- 37) T. Tominaga, V. R. Tirumala, E. K. Lin, J. P. Gong, H. Furukawa, Y. Osada, W. L. Wu, "The molecular origin of enhanced toughness in double-network hydrogels: A neutron scattering study", *Polymer*, **48**(26), 7449-7454 (2007)
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- 39) A. Putra, A. Kakugo, H. Furukawa, J. P. Gong, Y. Osada, T. Uemura, M. Yamamoto, "Production of Bacterial Cellulose with Well Oriented Fibril on PDMS Substrate", *Polym. J.*, **40**(2), 137-142 (2008)
- 40) H. Furukawa, M. Misu, K. Ando, H. Kawaguchi, "Light-Controlled On-off Switch of a Fluorescent Nanoparticle", *Macromol. Rapid Commun.*, **29**(7), 547-551 (2008)
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- 42) A. Putra, A. Kakugo, H. Furukawa, J. P. Gong, Y. Osada, T. Uemura, M. Yamamoto, "Tubular Bacterial Cellulose Gel with Oriented Fibrils on the Curved Surface", *Polymer*, **49**(7), 1885-1891 (2008)
- 43) A. Mori, T. Kaito, H. Furukawa, "Structural Anisotropy of Silica Hydrogels prepared under

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 - 47) Y. Tanaka, Y. Kawauchi, T. Kurokawa, H. Furukawa, T. Okajima, J. P. Gong, "Localized Yielding around Crack Tips of Double-network Gels", *Macromol. Rapid Commun.*, **29**, 1514-1520 (2008)
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 - 49) H. Furukawa, R. Kuwabara, Y. Tanaka, T. Kurokawa, Y.-H. Na, Y. Osada, J. P. Gong, "Tear Velocity Dependence of High-Strength Double Network Gels in Comparison with Fast and Slow Relaxation Modes Observed by Scanning Microscopic Light Scattering", *Macromolecules*, **41** (19), 7173-7178 (2008)
 - 50) D. Kaneko, H. Furukawa, Y. Tanaka, Y. Osada, J. P. Gong, "Flower Petal-like Pattern on Soft Hydrogels during Vodka Spreading", *Prog. Colloid and Polym. Sci.*, **135**, 225-230 (2008)
 - 51) H. Maemichi, K. Shikinaka, A. Kakugo, H. Furukawa, Y. Osada, J. P. Gong, "Morphogenesis of Liposomes Caused by Polycation-Induced Actin Assembly Formation", *Langmuir*, **24** (20), 11975-1981 (2008)
 - 52) M. Misu, H. Furukawa, H.-J. Kwon, K. Shikinaka, A. Kakugo, T. Sato, Y. Osada, J. P. Gong, "Photoinduced *in situ* Formation of Various F-Actin Assemblies with Photoresponsive Polycation", *J. Biomed. Mater. Res.: Part A*, **89A**(2), 424-431 (2009), (May 2009) (Article first published online: 22 April 2008) DOI: 10.1002/jbm.a.31990
 - 53) X.-F. Ni, A. Putra, H. Furukawa, J. P. Gong, "Synthesis of Novel Double Network Hydrogels via Atomic Transfer Radical Polymerization (ATRP)", *Composite Interfaces*, **16**, 433-446 (2009), (Published online: 02 April 2012), DOI:10.1163/156855409X450864
 - 54) T. Nakajima, H. Furukawa, Y. Tanaka, T. Kurokawa, Y. Osada, J. P. Gong, "True Chemical Structure of Double Network Hydrogels", *Macromolecules*, **42**(6), 2184-2189 (2009), (Published online: 18 February 2009)
 - 55) Z. L. Wu, H. Furukawa, W. Yang, J. P. Gong "Mesoscopic Network Structure of a Semi-Rigid Polyion Complex Nested in a Polycationic Hydrogel", *Advanced Materials*, **21**, 1-5 (2009) (Published online: 16 July 2009)
 - 56) T. Murosaki, T. Noguchi, A. Kakugo, A. Putra, T. Kurokawa, H. Furukawa, Y. Osada, J. P. Gong, Y. Nogata, K. Matsumura, E. Yoshimura, N. Fusetani, "Antifouling activity of synthetic polymer gels against cyprids of the barnacle (*Balanus amphitrite*) in vitro", *Biofouling*, **25**(4), 313-320 (2009), (Published online: 01 September 2010)

- 57) N. Naga, Y. Kihara, T. Miyanaga, H. Furukawa, “Synthesis of Organic– Inorganic Hybrid Gels from Siloxane or Silsesquioxane and α,ω -Nonconjugated Dienes by Means of a Photo Hydrosilylation Reaction”, *Macromolecules*, **42**(10), 3454-3462 (2009), (Published online:21 April 2009)
- 58) Q. M. Yu, Y. Tanaka, H. Furukawa, T. Kurokawa, J. P. Gong, “Direct Observation of Damage Zone around Crack Tips in Double-Network Gels”, *Macromolecules (Communication to the Editor)*, **42**(12), 3852-3855 (2009), (Published online:29 May 2009)
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- 61) Ananda Putra, Akira Kakugo, Hidemitsu Furukawa, Jian Ping Gong, “Orientated Bacterial Cellulose Culture Controlled by Liquid Substrate of Silicone Oil with Different Viscosity and Thickness”, *Polym. J.*, **41**(9), 764–770 (2009), (Published online:15 July 2009)
- 62) Y. Kawauchi, Y. Tanaka, H. Furukawa, T. Kurokawa, T. Nakajima¹, Y. Osada, J. P. Gong, “Brittle, ductile, paste-like behaviors and distinct necking of double network gels with enhanced heterogeneity”, *Journal of Physics: Conference Series*, **184**, 012016(8pp), (2009)
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- 70) Junji Saito, Hidemitsu Furukawa, Takayuki Kurokawa, Rikimaru Kuwabara, Shinya Kuroda, Jian Hu, Yoshimi Tanaka, Jian Ping Gong, Nobuto Kitamurae, Kazunori Yasuda, “Robust bonding and one-step facile synthesis of tough hydrogels with desirable shape by virtue of the double network structure”, *Polym.Chem*, **2**, 575-585 (2010) , (Published online: 09 November 2010) , DOI: 10.1039/C0PY00272K
- 71) Zi Liang Wu, Md. Arifuzzaman, Takayuki Kurokawa, Hidemitsu Furukawa, Jian Ping Gong, “Hydrogel with Cubic-Packed Giant Concentric Domains of Semi-Rigid Polyion Complex”, *Soft Matter*, **7(5)**, 1884-1889 (2011), (published online: 12 January 2011) , DOI: 10.1039/C0SM01139H
- 72) 日出間るり, 吉沢泰介, Khairi Bin NASARUDDIN, 古川英光, “形状記憶ゲルの繊維強化による自己修復材料の創製”, *日本機械学会論文集(A 編)*, Vol.77(2011-5), No.777[ノート No.2011-JAN-0215], pp.764-768(2011), (Published online:25 May 2011) DOI:10.1299/kikaia.77.764
- 73) Zi Liang Wu, Daisuke Sawada, Takayuki Kurokawa, Akira Kakugo, Wei Yang, Hidemitsu Furukawa, Jian Ping Gong, “Strain-Induced Molecular Reorientation and Birefringence Reversion of a Robust, Anisotropic Double-Network Hydrogel”, *Macromolecules* , **44(9)** , pp 3542–3547(2011), (Published online:23 March 2011) DOI: 10.1021/ma200123u
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- 76) 日出間るり, 杉田恵一, 古川英光, “レーザー走査照射による高強度ゲルの 3 次元光造形”, *日本機械学会論文集(A 編)*, Vol.77(2011-6), No.778[ノート No.2011-JAN-0128], pp.1002-1006 (2011) , (Published online:25 June 2011) DOI:10.1299/kikaia.77.1002
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- 79) Go Takada, Ruri Hidema, Hidemitsu Furukawa, “Ultrahigh Ductile Gels Developed by Inter Cross-linking Network (ICN)”, *J. Solid Mech. Mater. Eng.*, Vol.6(2012), No.2 Special Issue

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Review Articles:

- 1) Hidemitsu Furukawa, Jian Ping Gong, “Tough Hydrogel - Learn from Nature”, *Adv. Sci. Tech.*, **61**, 40-45 (2008) (Trans Tech Publications, Switzerland)
- 2) A. Putra, H. Furukawa, A. Kakugo, J. P. Gong, “Novel Oriented Bacterial Cellulose Gels on Oxygen-Permeable Substrates”, *Cellulose Communications*, **15**(2), 73-78 (2008.6)
- 3) Tasuku Nakajima, Takayuki Kurokawa, Hidemitsu Furukawa, Qiu Ming Yu, Yoshimi Tanaka, Yoshihito Osada, Jian Ping Gong, “Super tough gels with a double network structure” *Chinese Journal of Polymer Science*, PP2008 Special Issue, in press.

Additionally, the other 12 review articles written in Japanese.

Books: 5 partly written books in Japanese.

Main Invited Talks at International Occasions:

- 1) Hidemitsu Furukawa, “Hierarchy Structure in Polymer Gels Studied with Scanning Microscopic Light Scattering”, Joint Workshop between Hokkaido University and Zhejiang University on Functional Polymers, Zhejiang University (2005.10.23)
- 2) Hidemitsu Furukawa, “Anomalous Robust Double Network Gels Studied with Scanning Microscopic Light Scattering”, Seminar at Materials Science and Engineering laboratory, NIST (2006.3.20)
- 3) Hidemitsu Furukawa, Yukari Shigekura, Yongmei Chen, Tatsuo Kaneko, Daisaku Kaneko, Jian Ping Gong, Yoshihito Osada, “Anisotropic Polyion-complex Gels via Template Polymerization”, The 3rd Conference on Artificial Muscles, Akihabara Convention Hall, Tokyo, May 30-31 (2006.5.30)
- 4) Hidemitsu Furukawa, Jian Ping Gong, “Tough Hydrogel – Learn from Nature”, CIMTEC 2008 – 3rd International Conference on Smart Materials, Structures and Systems, Acireale, Sicily, Italy (2008.6.12)
- 5) Hidemitsu Furukawa, “Tough Hydrogels – Learn from Nature”, Taiwan-Japan Bilateral Symposium on Surface/Interface Sciences and Nanosoft Materials, Taroko, Hualien, Taiwan (2008.8.8)

Additionally, more than 60 times invited lectures for domestic occasions.

Patents:

1 US patent* and the other more than 17 Japanese patents

*Hidemitsu Furukawa, "Light Scattering Apparatus, Light Scattering Measurement Method, Light Scattering Analysis Apparatus and Light Scattering Measurement Analysis Method",
U.S. Patent Applications No. 11/070, 270 (2007.7.18)