Funding Arrangement for NAIST – NCTU Collaboration

1. Title: 雷射結晶化日台共同研究補助金
2. Title: 增原宏雷射生物奈米科學研究室國內外學術交流基金

Promotion of PhD Student to Professor in Japanese University

Tsung-Han Liu (李宗翰) will be promoted as Assistant Professor of Kwansei Gakuin University in Japan on April 1, 2018. He was a PhD student, got PhD degree on August 2017, and now is working in Osaka University as a postdoctoral fellow.

Dual Degree Program Students

1.	Shinpei Nishimura 西村晋平	(Saitama University - NCTU)	2012.08-2015.09
2.	Kazuki Okano 岡野和希	(Saitama University - NCTU)	2017.10-2018.03
3.	Chiang Wei.-Yi. 江威逸	(NCTU - Katholieke Universiteit Leuven)	2014.09-2017.11
4.	Chi-Shuen Wu 吳奇勳	(NCTU - Saitama University)	2016.10-2017.09

JSPS Overseas Research Fellows

1.	Masayasu Muramatsu	村松正康	2012.04-2013.03
2.	Tetsuhiro Kudo	工藤哲弘	2014.04-2016.03
3.	Morihiko Hamada	濱田守彦	2015.04-2016.03
4.	Yugo Hayashi	林有吾	2015.06-2015.08 2016.02-2016.03

Japanese Students Studying with Us

(1)	Sho Fujii (Chuo University)	2010.01.24-2010.02.11
(2)	Sho Fujii (Chuo University)	2010.08.14-2010.09.04

(3) Hayato Inoue (Chuo University) 2010.07.01-2010.08.25
(4) Hayato Inoue (Chuo University) 2011.01.16-2011.01.20
(5) Jino George (National Institute for Interdisciplinary and Technology, Trivandrum, India) 2011.10.15-2011.12.14
(6) Daiki Kimura (Saitama University) 2012.08.21-2012.11.28
(7) Shimpei Nishimura (Saitama University) 2012.08.21-2012.11.28
(8) Shimpei Nishimura (Saitama University) 2012.12.25-2013.02.23
(9) Shimpei Nishimura (Saitama University) 2013.06.20-2013.09.16
(10) Shimpei Nishimura (Saitama University) 2013.11.11-2014.01.25
(11) Shimpei Nishimura (Saitama University) 2014.02.11-2015.09.30
(12) Tetsuhiro Kudo (Osaka Prefecture University) 2012.11.09-2013.02.01
(13) Tetsuhiro Kudo (Osaka Prefecture University) 2013.09.06-2013.11.08
(14) Mizuki Sato (Yamagata University) 2014.08.01-2014.09.30
(15) Fuyuto Takahashi (Chiba University) 2014.12.15-2015.01.05
(16) Wakana Nishiyama (Yamagata University) 2015.08.01-2015.09.30
(17) Ryo Kihara (Ehime University) 2015.11.02-2015.11.30
(18) Jun Hyung Lee (Chiba University) 2015.12.01-2016.01.31
(19) Kazuki Okano (Saitama University) 2016.10.14-2016.12.13
(20) Daiki Suzuki (Saitama University) 2016.10.14-2016.12.13
(21) Masamichi Nisogi (Ehime University) 2016.11.05-2016.12.06
(22) Keisuke Masuda (Ehime University) 2016.11.05-2016.12.06
(23) Takuya Takeshige (Saitama University) 2017.11.01-2018.01.09
(24) Keisuke Meguriya (Saitama University) 2017.11.01-2018.01.09
(25) Taisei Himeda (Ehime University) 2017.11.06-2017.12.10
(26) Hiroki Omoda (Ehime University) 2017.11.06-2017.12.10
(27) Kazuki Okano (Saitama University) 2017.09.09-2018.01.31

Our Students Studying Abroad

(1) Wei-Yi Chiang at KU Leuven, Belgium 2014.09.01-2015.08.31
(2) Wei-Yi Chiang at KU Leuven, Belgium 2016.10.20-2017.09.28
(3) Tsung-Han Liu at Osaka University, Japan 2014.04.02-2014.08.29
(4) Tsung-Han Liu at Osaka University, Japan 2014.11.03-2014.12.09
(5) Tsung-Han Liu at Osaka University, Japan 2015.11.30-2016.06.30

(6) Po-Jen Chen at Hokkaido University, Japan
2014.07.12-2015.05.31
(7) Ting-Wen Chien at Hokkaido University, Japan
2014.07.12-2015.05.31
(8) Ding-Shiang Chiu at Hokkaido University, Japan
2016.03.27-2016.09.20
(9) Chi-Shiun Wu at Saitama University, Japan
2016.10.01-2017.09.08
(10) Yen-En Liu at Hokkaido University, Japan 2016.03.31-2016.08.12
(11) Yi-Ju Wu at Ehime University, Japan 2017.07.31-2017.09.01

Organizing Summer Course and Workshop on Single Molecule/nanoparticle Spectroscopy and Imaging

(1) The International Summer Course and Workshop (June 2012, NCTU); 76 participants
Lecturers: Johan Hofkens (KU Leuven, Belgium)
Tamai Naoto (Kwansei Gakuin University, Japan)
Organizing Committee: Yun-Wei Chiang (NTHU), Hiro-o Hamaguchi (NCTU), Hsin-Yun Hsu (NCTU), Kuo-Chu Hwang (NTHU), Jih-Ru Hwu (NTHU), Yaw-Kuen Li (NCTU), Atsushi Miura (NCTU), Jeng-Tzeng Sheu (NCTU), Shinsuke Shigeto (NCTU), Pawel Urban (NCTU), Tung-Kung Wu (NCTU)
(2) The 2nd International Summer Course and Workshop (June 2013, NCTU); 82 participants
Lecturers: Hiroaki Misawa (Hokkaido University, Japan)
Tatsuya Tsukuda (University of Tokyo, Japan)
Christy Landes (Rice University, U.S.A.)
Stephan Link (Rice University, U.S.A.)
Organizing Committee: Yu-Chie Chen (NCTU), Yun-Wei Chiang (NTHU), Hiro-o Hamaguchi (NCTU), Hsin-Yun Hsu (NCTU), Jer-Shing Huang (NTHU), Jih-Ru Hwu (NTHU), Kuo-Chu Hwang (NTHU), Yaw-Kuen Li (NCTU), Cheng-An J. Lin (CYCU), Atsushi Miura (NCTU), Jeng-Tzeng Sheu (NCTU), Shinsuke Shigeto (NCTU), Pawel Urban (NCTU), Tung-Kung Wu (NCTU)
(3) The 3nd International Summer Course and Workshop (June 2014, NCTU); 107 participants

Lecturers: Steven De Feyter (KU Leuven, Belgium)
Mizuo Maeda (RIKEN Institute, Japan)
Tomoji Kawai (Osaka University, Japan)
Organizing Committee: Yun-Wei Chiang (NTHU), Hiro-o Hamaguchi (NCTU), Hsin-Yun Hsu (NCTU), Kuo-Chu Hwang (NTHU), Jih-Ru Hwu (NTHU), Yaw-Kuen Li (NCTU), Jeng-Tzeng Sheu (NCTU), Shinsuke Shigeto (NCTU), Pawel Urban (NCTU), Tung-Kung Wu (NCTU), Cheng-An J. Lin (CYCU), Jer-Shing Huang (NTHU), Yu-Chie Chen (NCTU)

(4) The 4th Hsinchu Summer Course and Workshop (June 2015, NCTU); 125 participants
Lecturers: Hitoshi Tamiaki (Ritsumeikan University, Japan)
Haruo Inoue (Tokyo Metropolitan University, Japan)
Keisuke Goda (University of Tokyo, Japan)
Takeharu Nagai (Osaka University, Japan)
Local Organizing Committee: Jiun-Tai Chen, Yen-Ju Cheng, Hsin-Yun Hsu, Ian Liau (Co-Chair), Hiroshi Masuhara (Co-Chair) (NCTU)
Organizing Committee: Yu-Chie Chen, Eric Diau, Hiro-o Hamaguchi, Jeng-Tzong Sheu, Pawel Urban, Tung-Kung Wu (NCTU)
Yun-Wei Chiang, Jer-Shing Huang, Kuo-Chu Hwang, Jih-Ru Hwu (NTHU)
Honorary Organizing Committee
Chain-Shu Hsu, Yuan-Pern Lee, Yaw-Kuen Li(NCTU)

(5) The 5th Hsinchu Summer Course and Workshop (June 2016, NCTU); 176 participants
Lecturers: Martin Vach (Tokyo Institute of Technology, Japan)
Chihaya Adachi (Kyushu University, Japan)
Tsutomu Miyasaka (Toin University of Yokohama, Japan)
Junji Kido (Yamagata University, Japan)
Hiroaki Misawa (Hokkaido University, Japan)
Local Organizing Committee: Jiun-Tai Chen, Yen-Ju Cheng, Hsin-Yun Hsu, Ian Liau (Co-Chair), Hiroshi Masuhara (Co-Chair), Teruki Sugiyama (NCTU)
Organizing Committee: Teng-Ming Steve Chen, Eric Diau, Kien-Wen Sun, Chien-Lung Wang (NCTU)
Chien-Tien Chen, Chien-Hong Cheng, Yun Chi (NTHU)
Honorary Organizing Committee: Chain-Shu Hsu, Yuan-Pern Lee, Yaw-Kuen Li (NCTU)

(6) The 6th Hsinchu Summer Course and Workshop (June 2017, NCTU); 157 participants
(Co-organized by JSPS Grants-in-Aid for Scientific Research "Nano-Material Manipulation and Structural Order Control with Optical Forces")
Lecturers: Hajime Ishihara (Osaka University, Japan) “Optical properties and manipulation of nanomaterials”
Seiji Akita (Osaka Prefecture University) “Electronic and mechanical properties of nanomaterials”
Yasuyuki Tsuboi (Osaka City University) “Fabrication and manipulation of bio-molecular and polymer nanomaterials”
Maarten Roeffaers (KU Leuven): “Imaging and chemical properties of nanomaterials”
Tsukasa Torimoto (Nagoya Univesity) “Fabrication and functionalization of metal and semiconductor nanomaterials”
Organizing Committee: Jiun-Tai CHhen, Yen-Ju Cheng, Li-Kang Chu, Hsin-Yun Hsu, Hajime Ishihara, Ian Liau, Hiroshi Masuhara, Takashige Omatsu, Chi-How Peng, Keiji Sasaki, Teruki Sugiyama, Chien-Lung Wang
Honorary Organizing Committee: Kikuo Cho, Chain-Shu Hsu, Tadashi Ito, Yuan-Pern Lee, Yaw-Kuen Li

Masuhara School (增原塾) at NCTU

(1) (July 2, 2017, NCTU)；Japanese graduate students who belong to laboratories supervised by the members of JSPS Grant-in-Aid Project on “Nano-Material Optical-Manipulation”; 24 participants

(2) (March 26, 2018, NCTU)；Professors, undergraduate students, and high school students who belong to “High-grade Global Education Program for Sciences (HiGEPS)” organized by Saitama University; 20 participants

Super Science High School Students Visiting Us

(1) Osaka Takatsuki High School, 97 students, 2016.11.16
(2) Oita Maitsuru High School, 20 students, 2016.12.15
(3) Osaka Takatsuki High School, 86 students, 2017.11.17
(4) Oita Maitsuru High School, 25 students, 2017.12.26

HiGEPS (High-grade Global Education Program for Sciences) Visiting Us

(1) Saitama University and High schools in Saitama prefecture,
4 professors, 4 undergraduate students, 4 high school students
2018.03.26

Professors we invited to Department Seminar of Applied Chemistry

(1) Yasuyuki Tsuboi (Hokkaido University)
"Laser and Plasmonic Photochemistry", October 2011

(2) Tsuyoshi Asahi (Ehime University)
"Organic Nanoparticle Colloids: Preparation, Optical Potential Applications", October 2011

(3) Yasuhisa Mizutani (Osaka University)
"Watching Ultrafast Protein Dynamics by Time-Resolved Visible and Ultraviolet Resonance Raman Spectroscopy", October 2011

(4) Kirsch-De Mesmaeker (Free University of Brussels)
"From Mononuclear to Polynuclear Complexes Assembling with Bridging Ligands or Derivatized Oligonucleotides", November 2011

(5) Shun Hirota (NAIST)
"Investigation and Regulation of Protein and Peptide Structural Changes", December 2011

(6) Takashi Fuyuki (NAIST)
"Recent Progress in High Efficiency Crystalline Si Solar Cells"
April 2012

(7) Hiroshi Daimon (NAIST)
"Three-Dimensional Measurement of Orbital Angular Momentum, Orbital Symmetry, and Atomic Structure Using Synchrotron Radiation Two-Dimensional Photoelectron Spectroscopy", April 2012

(8) Haruo Inoue (Tokyo Metropolitan University)
"How Can We Get through The Bottleneck of The Artificial Photosynthesis?", May 2012

(9) Jun-ichi Kikuchi (NAIST)
"Cerasomes as a Bioinspired Organic-Inorganic Hybrid Nanomaterial", May 2012

(10) Maki Kawai (The University of Tokyo)
"Single Molecule Level Spectroscopy of Molecules at Surfaces", October 2012

(11) Kei Murakoshi (Hokkaido University)
"Selection-Rule Breakdown at Plasmon-Assisted Electronic Excitation of A Single Molecule at Metal Nano-Gap", December 2012

(12) Isao Azumaya (Tokushima Bunri University)
"Spontaneous Resolution of Achiral Organic Compounds" December 2012
(13) Noboru Kitamura (Hokkaido University)
"Spectroscopic and Photophysical Characteristics of Organoboranes and Their Transition Metal Complexes", December 2012
(14) Hideko Koshima (Ehime University)
"Solid-state Photochemistry: From Photoreactions to mechanical Crystal Machinery", April 2013
(15) Hiroshi Fukumura (Tohoku University)
"Laser-Induced Phase Separation of Binary Solvents: Its Fundamentals and Application to Photochemistry", May 2013
(16) Seiichiro Nakabayashi (Saitama University)
"Hydrogen Nano-Bubble at Normal Hydrogen Electrode", May 2013
(17) Kazuhiko Mizuno (NAIST)
"Photochemical Behavior of Inter-and Intramolecular Exciplexes" May 2013
(18) Michiya Fujiki (NAIST)
"Mirror Symmetry Breaking and Restoration from Optically Inactive polymer Particles in Suspension by Solvent Chirality Transfer and/or by Pumping Circularly Polarized Light: Inspired from Oparin's Coacervate Hypothesis", May 2013
(19) Arthur Chiou (National Yang Ming University)
"Optical Tweezers Based Bio-Micro-Rheology", October 2013
(20) Shun Hirota (NAIST)
"Assembling and function of cytochrome c", October 2013
(21) Hiroyuki Sugimura (Kyoto University)
"Nanofabrication of Surface Materials", October 2013
(22) Hiroyuki Yoshikawa (Osaka University)
"Plasmonic Nanoparticle Manipulation and Biosensing with Focused Laser Beams", November 2013
(23) Hikaru Kobayashi (Osaka University)
"New Chemical Methods for Improvement of Crystalline Si Solar Characteristics", December 2013
(24) Kazushi Miki (National Institute for Materials Science)
"Metal Nanoparticles 2D Array for Chemical Reactor and Bio Sensor", April 2014

(25) Toru Nakano (Osaka University, Dean of Graduate School of Frontier Bioscience)
"Introduction to Epigenetics", October 2014
(26) Jun-ichi Hotta (Yamagata University)
"Super-Resolution Fluorescence Microscopy and its Application on Diatoms", December 2014
(27) Hiroaki Misawa (Hokkaido University)
"Frontier in Plasmonic Chemistry", December 2014
(28) Koichi Kato (Okazaki Institute for Integrative Bioscience & Institute for Molecular Science)
"Biophysical Exploration of Biomolecular Systems Characterized by Conformational Dynamics and Dynamical Assembly", December 2014
(29) Yasuhiro Iwasawa (The University of Electro-Communications)
"Intriguing Insights into How Catalysts Behave in Automobile Fuel Cells by Time- and Spatially-Resolved XAFS Techniques", December 2014
(30) Yoshihisa Inoue (Osaka University)
"Photochirogenesis in Molecular, Supramolecular and Biomolecular Regimes", March 2015
(31) Kizashi Yamaguchi (Osaka University)
"Theoretical Studies of Native and Artificial Catalysts for Water Oxidation by the X-ray Free Electron Laser", May 2015.
(32) Takanori Fukushima (Tokyo Institute of Technology)
"Design of Functional Soft Materials Based on the Concept of "π-Figuration", May 2015.
(33) Junji Nishii (Hokkaido University)
"Periodic Structured Devices for Optical Imaging and Plasmon-enhanced Fluorescence Microscopy", September 2015
(34) Kazue Kurihara (Tohoku University)
"Surface Forces Measurement: Fundamentals and Recent Development", October 2015
(35) Gen Sazaki (Hokkaido University)
"Surface Melting of Ice Crystals Revealed by Advanced Optical Microscopy", October 2015
(36) Yasuyuki Tsuboi (Osaka City University)
"Plasmon-induced-Breakthrough in Photochemistry: Reaction, Processing, and Manipulation", November 2015

(37) Keiji Sasaki (Hokkaido University)
"Photon Nanoshaping and Its Application to Photochemistry" April 2016
(38) Hiromi Okamoto (Institute for Molecular Science)
"Micro- and Nano-scopic Optical Activity Measurements", May 2016
(39) Nobuo Kimizuka (Kyushu University)
"Molecular Self-assembly for Photon Upconversion", May 2016
(40) Jiro Abe (Aoyama Gakuin University)
"Fundamentals and Applications of Fast Photoswitch Molecules" May 2016
(41) Atsushi Takahara (Kyushu University)
"Design of (Organic Material/Natural Inorganic Nanotube) Assemblies through Precise Interfacial Structure Control", October 2016
(42) Vasudevan Pillai Biju (Hokkaido University)
"Impeding Oxidation and Blinking in Single Semiconductor Quantum Dots", November 2016
(43) Hiroyuki Sugimura (Kyoto University)
"Chemistry and Photochemistry of Graphene Oxide", December 2016
(44) Hiroaki Misawa (Hokkaido University)
"Plasmon Coupling in Photochemistry", February 2017
(45) Satoshi Nishimura (Jichi Medical University)
"Living animal imaging methods for biological research using handmade one/two photon fluorescence microscope", March 2017
(46) Tadashi Sugawara (Kanagawa University, Emeritus of The University of Tokyo)
"Construction of Giant Vesicle-based Model Protocells", October 2017
(47) Susumu Uchiyama (Osaka University)
"Biophysical Characterizations of Biopharmaceuticals", December 2017
(48) Ryota Iino (Institute for Molecular Science)
"High-speed Single-molecule Imaging Analysis of Protein Molecular Motors Probed by Gold Nanoprobes", December 2017

Professors we invited to Laboratory Seminar

(1) Shoji Ito (Osaka University)
"Evaluation of Nanoscale Heterogeneity in Thin Film Materials with Wide-Field Single Molecule Fluorescence Microscopy" 2009.04.29

(2) Takahiro Kaji (Osaka University)
"Conformational Fluctuation of DNA Chains on Time Scales from ns to ms Revealed by Single-Molecule Photon Statistics" 2009.04.29

(3) Hiroyuki Sugimura (Kyoto University)
"VUV Microfabrication-Photopatterning of Organic Materials Using Vacuum Ultra-Violet Light" 2009.04.29

(4) Mitsuru Ishikawa (AIST)
"Enhancement of fluorescence detection using one-dimensional photonic crystal structures" 2009.10.13

(5) Vasudevan Pillai Biju (AIST)
"Bioconjugated quantum dots for probing biophysical dynamics in living cells" 2009.10.13

(6) Tamitake Itoh (AIST)
2009.10.13

(7) Masaaki Haga (Chuo University)
"Manipulation and immobilization of single DNA and nanoparticles at laser focal point on Au surface and its application" 2010.01.25

(8) Michel Sliwa (University de Lillel, France)
"Chemometric Analysis of Ultrafast Transient Absorption Spectroscopy Data: Characterization of The Ultrafast Photodynamics of Photochromic Reactions" 2010.08.19

(9) Kenji Katayama (Chuo University)
"A New Transient Grating Technique and Its Application for Photochemical Reaction Dynamics Measurement" 2011.01.13 ~ 2011.01.16

(10) Hitoshi Watarai (Osaka University)
"Novel Application of Magnetic Fields in Micro-Analytical Chemistry" 2011.03.07

(11) Minoru Kato (Ritsumeikan University)
"Understanding of Pressure Denaturation of Proteins: An Approach from Model Peptides" 2011.07.08

(12) Hiroshi Miyasaka (Osaka University)
"Multiphoton-gated Photochromic Reaction in Diarylethene and Fulgide Derivatives" 2011.11.16
(13) Masaaki Ashida (Osaka University)
"Optical Manipulation of Semiconductor Nanoparticles Using Resonant Radiation Force" 2012.04.06
(14) Hajime Ishihara (Osaka Prefecture University)
"Challenge for Resonant Optical Manipulation of Nanostructures" 2012.04.06
(15) Hirofumi Tanaka (Osaka University)
"Electronic Measurement in Nanoscale: Nanoparticle on Nanocarbon Systems" 2012.04.16
(16) Dong-Hee Son (Texas A&M University)
"Energy Transfer and Charge Carrier Transfer Dynamics in Mn-doped Semiconductor Nanocrystals" 2012.05.21
(17) Keitaro Yoshihara (Emeritus professor of Institute for Molecular Science)
"Reminiscence of a Molecular Scientist: Some Words for Young Researchers" 2012.05.28
(18) Yukiteru Katsumoto (Hiroshima University)
"Molecular Picture of the Thermo-Responsive Polymers" 2012.08.06
(19) Hideko Koshima (Ehime University)
"Solid-state Photochemistry: from Photoreactions to Mechanical Crystal Machinery" 2012.08.21 ~ 2012.08.25
(20) Yu Nabetani (Tokyo Metropolitan University)
"Photochemistry of Molecular Assembly Coupled with Surrounding Microenvironment" 2012.08.22
(21) Hiroshi Yoshikawa (Saitama University)
"Bio-applications of Ultrafast Laser Pulses to Protein Crystallization and Cell Adhesion Strength Measurement" 2012.08.22
(22) A.M. Brouwer (University of Amsterdam)
"Fluorescence Microscopy in Materials Science" 2012.09.06
(23) Tohru Yoshioka (Kaohsiung Medical University)
"Significance of Proton Signaling in the Living Cell" 2012.09.19
(24) Masahiro Kitajima (National Defense Academy of Japan)
"Coherent Phonons and Application to The Study of SERS Dynamics" 2012.10.02

(25) Travor Smith (University of Melbourne)
"Microscopy with High Spatial and Temporal Resolution" 2012.10.02
(26) Atsushi Nakajima (Keio University)
"Electronic Properties of Binary Super Atom Clusters and Their Assembly" 2012.10.03
(27) Tadaaki Ikoma (Niigata University)
"Photocarrier Dynamics in Organic Solar Cell Studied by Magnetic Field Effects" 2012.10.26
(28) Hiroyuki Takei (Toyo University)
"Cap-shaped Noble metal Particles Applied to Various Surface-enhanced Spectroscopic Technique" 2013.02.25
(29) Tomoaki Hinoue (Osaka University)
"Control of Self-assembly and Crystallization of Polymers by Inkjet Ssystem" 2013.03.22
(30) Elena Perevedentseva (National Dong Hwa University)
"Biomedical Applications of Nano Diamond" 2013.05.13
(31) Hiromasa Niinomi (Nagoya University)
"Emergence and Amplification of Chirality in Sodium Chlorate Chiral Crystallization from An Aqueous Solution" 2013.10.15
(32) Hiroshi Ikeda (Osaka Prefecture University)
"Spectroscopic and Exploratory Study of the Radical Cation Possessing One-Electron Sigma Bond" 2013.11.19
(33) Yasunori Matsui (Osaka Prefecture University)
"The Excited State C-C Bond Cleavage-Emission System Based on Methylenecyclopropanes" 2013.11.19
(34) Eisuke Ohta (Osaka Prefecture University)
"Synthesis of 2,2'-bis(diarylboryl)biphenyl and Theoretical Study on the One-Electron Sigma-Bonding Nature of Its Radical Anion" 2013.11.19
(35) Kuan-Lin Liu (Katholieke University Leuven)
"Light Microscope for Catalysis Study" 2013.12.27
(36) Eri Chatani (Kobe University)
"Exploring Early Association of Protein Molecules in the Amyloid Formation" 2014.01.20
(37) Shun Hirota (NAIST)
"Constructing Protein Supramolecules by Domain Swapping. Its Formation Mechanism and Effect on Cell Membranes" 2014.03.10

(38) Tetsu Yonezawa (Hokkaido University)
"Facile Preparation of Metel Nano/fine Particles for Electronics and Fluorescence" 2014.03.10
(39) Kei Murakoshi (Hokkaido University)
"Plasmon-induced Photoexcitation to Break a Selection Rule of Electronic Excitation" 2014.04.30
(40) Rachel Méallet-Renault (Department of Chemistry Ecole Normale Supérieure de Cachan, France)
"Fluorescent Organic Nanoparticles for Bioimaging" 2014.06.13
(41) Takashige Omatsu (Graduate School of Advanced Integration Science, Chiba University)
"Chiral Photonics－Helical Light Pioneer Chiral Materials Science-" 2014.06.23
(42) Hiroshi Yoshikawa (Saitama University)
"Quantitative Evaluation of Cell Adhesion by Advanced Optical Techniques" 2014.07.30
(43) Naritaka Kobayashi (Saitama University)
"Atomic-Scale Imaging at Solid/Liquid Interfaces by FM-AFM" 2014.07.30
(44) Satoshi Fujita (University of Fukui)
"Electrospun Nanofibers for Prevention of Cancer Recurrence" 2014.08.29
(45) Yu Nabetani (Tokyo Metropolitan University)
"Nanostructure and Photoreaction of Molecular Assemblies in Various Microenvironments" 2014.09.12
(46) Takayuki Uwada (Josai University)
"Spectroscopic Investigation and Crystallization of Photoluminescent Au Quantum Dots Encapsulated in Protein" 2014.11.03
(47) Hisashi Okumura (Research Center for Computational Science, Institute for Molecular Science, National Institutes of Natural Sciences, Okazaki, Japan)
"Molecular Dynamics Simulations for Dimerization and Disruption of Amyloid- fibril" 2014.11.26
(48) Fuyuto Takahashi (Chiba University)
"Chiral Structure Fabrication by Optical Vortex Processing" 2014.12.23

(49) Morihiko Hamada (Kagawa University, Japan)
"Photochemical Reaction of CdSe/ZnS Single Quantum Dots with Electron Acceptors and Donors" 2015.01.14 ~ 2015.01.16
(50) Shimpei Nishimura (NCTU/Saitama University)
"Laser Trapping Studies on Protein Crystallization: Research and Life in Taiwan as a First Student of Double Degree Program between National Chiao Tung University and Saitama Universtiy" 2015.02.11
(51) Yoshihiko Arita (School of Physics & Astronomy, University of St Andrews, UK)
"Let Nothing Slow You down: New Perspectives in Optical Manipulation" 2015.04.29 ~ 2015.05.02
(52) Yugo Hayashi (NAIST)
"Domain Swapping of Thermostable Cytochrome C" 2015.06.03
(53) Yoichiroh Hosokawa (NAIST)
"Experimental and Theoretical Analysis of Femtosecond Laser Impulse and Its Application for Plant Cell Physiology" 2015.06.16
(54) Fu Jen Kao (Institute of Biophotonics, National Yang-Ming University)
"Two-photon Microscopy with Stimulated Emission" 2015.06.16
(55) Wei Shun Chang (Department of Chemistry Rice University)
"Steady-state Absorption, Scattering and Time-resolved Transient Extinction Spectra of Single Plasmonic Nanoparticles" 2015.06.24
(56) Hiroaki Misawa (Hokkaido University)
"Gold nano-structures with large near field enhancement" 2015.08.12
(57) Hiroaki Misawa (Hokkaido University)
"Advanced Lithography Technology for Nano-fabrications" 2015.09.17
(58) Anwar Usman (Universiti Brunei Darussalam)
"Multiexciton Generation and Photoinduced Electron Transfer in Ag2S and PbS Quantum Dots ─Research and Life in Saudi Arabia and Brunei Darussalam─" 2015.09.17
(59) Hiroaki Misawa (Hokkaido University)
"Atomic Layer by layer Deposition Technology for Next Generation Electronics" 2015.09.21
(60) Hiroaki Misawa (Hokkaido University)
"Advanced Etching Technologies for Nano-fabricaitons" 2015.10.29

(61) Hiroaki Misawa (Hokkaido University)
"Essential Instruments for Measurement of Nano-structure and Nano-material" 2015.11.02

(62) Fuyuki Ito (Shinshu University)
"Fluorescence Visualization of Molecular Assembly Processes during Solvent Evaporation" 2015.11.16 ~ 104.11.18

(63) Hiroaki Misawa (Hokkaido University)
"Interaction between Plasmonic Metal Nanostructures and Molecules" 2015.11.23

(64) Hiroaki Misawa (Hokkaido University)
"Plasmon-assisted Energy Converstion Systems" 2015.11.26

(65) Hiroshi Yoshikawa (Saitama University)
"Control of Protein Crystal Growth by Femtosecond Laser Ablation" 2015.12.07

(66) Akihiro Furube (Institute of Technology and Science, Tokushima university)
"Ultrafast Spectroscopic Study on Exciton and Charge Transfer in Solar Energy Conversion Nanomaterials" 2016.03.07

(67) Shun Hirota (NAIST)
"Structure and Function of Proteins and Protein Complexes" 2016.03.29 ~ 2016.03.31

(68) Fumitaka Ishiwari (Institute of Innovative Research, Tokyo Institute of Technology, Japan)
"Bioinspired Design of a Ca^{2+} Sensor Using Polymer Chain Dynamics" 2016.05.16 ~ 2016.05.18

(69) Yasuteru Shigeta (Center for Computational Sciences, University of Tsukuba, Japan)
"Computational analyses on structures and photochemical properties of molecules" 2016.11.02

(70) Olivier Soppera (Institut de Science des Materiaux de Mulhouse CNRS UMR 7361, France)
"Unconventional Processes and Materials for Light-induced Micro-nanofabrication" 2016.11.30

(71) Shutaro Ishida (Hokkaido University)
"Nano-particle rotation using a plasmonic nano-structure" 2017.02.20

(72) Hiromasa Niinomi (Chiba University)
"Emergence and Amplification of Chirality in Sodium Chlorate Chiral Crystallization from an Aqueous Solution" 2017.04.25

(73) Hiromasa Niinomi (Chiba University)
"Enantioselective amplification in $NaClO_3$ chiral crystallization induced by circularly polarized laser trapping of plasmonic particles at air/solution enantioselective amplification in $NaClO_3$ chiral crystallization induced by circularly polarized laser" 2017.05.09
(74) Yoichiro Hosokawa (NAIST)
"Laser cell analysis and manipulation for future biotechnology" 2017.05.23
(75) Wei Shun Chang (Rice University)
"Spectro-electrochemical and ultrafast microscopies on single plasmonic nanostructures" 2017.05.31
(76) Takeharu Nagai (Osaka University)
"Various application of Super-duper Chemiluminescent proteins - from Bioimaging to Glowing Plants" 2017.06.16
(77) Masahiro Higashi (University of the Ryukyus)
"Theoretical investigation of excited-state reactions and properties in condensed phases" 2017.08.07
(78) Hideyoshi Motogi (University of the Ryukyus)
"Theoretical study on domain-swapped oligomer formation of cytchrome c" 2017.08.07
(79) Hiroshi Yoshikawa (Saitama University)
"Active control of self-organization of biomolecules by using focused laser beams" 2017.11.14
(80) Ryuzo Kawamura (Saitama University)
"ATP-fueled active network of microtubules driven by kinesin biomotor proteins" 2017.11.14
(81) Hiroaki Misawa (Hokkaido University)
"Recent advanced in plasmonic chemistry" 2017.11.14
(82) Johan Hofkens (Katholieke Universiteit Leuven)
"Recent Advances in Single Molecule Spectroscopy and Imaging" 2017.11.22


Nobuyo M.

Research Activity

Representative papers demonstrating future possibilities in laser trapping studies

GDCh Communications Angewandte

Amyloid Fibrils Hot Paper

International Edition: DOI: 10.1002/anie.201702352
German Edition: DOI: 10.1002/ange.201702352

A Single Spherical Assembly of Protein Amyloid Fibrils Formed by Laser Trapping

Ken-ichi Yuyama, Mariko Ueda, Satoshi Nagao, Shun Hirota, Teruki Sugiyama,* and Hiroshi Masuhara**

Abstract: *Protein amyloids have received much attention owing to their correlation with serious diseases and to their promising mechanical and optical properties as future materials. Amyloid formation has been conducted by tuning temperature and chemical conditions, so that its nucleation and the following growth are analyzed as ensemble dynamics. A single spherical assembly of amyloid fibrils of cytochrome c domain-swapped dimer was successfully generated upon laser trapping. The amyloid fibrillar structure was confirmed by fluorescence characterization and electron microscopy. The prepared spheres were further manipulated individually in solution to fabricate a three-dimensional microstructure and a line pattern. Amyloid formation dynamics and amyloid-based microstructure fabrication are demonstrated based on direct observation of a single spherical assembly, which foresees a new approach in amyloid studies.*

Dynamics and mechanism of amyloid formation and crystallization of proteins have been studied comparatively, since both consist of nucleation and the following growth process where some time lag is usually observed.[1] Amyloid nucleation is started from misfolded and unfolded conformations of proteins and leads to fibrillation through mutual interactions of prefibrillar oligomer intermediates.[2] Protein crystallization is coupled with the formation of protein clusters containing solvent waters and the subsequent generation of a highly concentrated area of such clusters.[3] Nucleation and the crystal growth proceed in such an area of a few tens to a few hundreds of nanometers. Most of the experiments for amyloid formation and crystallization are carried out in solution by tuning pH,[1] salt concentration,[1] and temperature[2] and by applying ultrasonication,[1] electromagnetic field,[1] and pulsed laser irradiation.[3,4] Therefore, all the processes of nucleation and growth of amyloid and crystal in solution proceed randomly in parallel, whose dynamic evolutions are monitored and analyzed as an ensemble of amyloid fibrils or crystals. It is considered very promising to propose a new experimental approach for preparing a single spherical assembly of protein amyloid, analyzing its dynamics, and fabricating micro-structures from single assemblies. It will enable us to perform amyloid studies by watching always when and where individual assemblies of amyloid fibrils are prepared, monitored, and utilized.

Herein we report a laser trapping study on oxidized monomeric horse cytochrome (cyt) c and its domain-swapped dimer (Figure 1 A,B).[7] Cyt c is a well-known globular heme

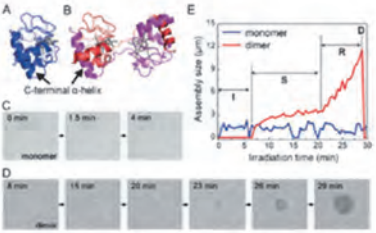


Figure 1. Laser trapping of cyt c. A),B) Molecular structures of oxidized monomeric and domain-swapped dimeric horse cyt c. C),D) Laser trapping of monomeric and dimeric cyt c. The size of images is 40 × 35 μm². E) The time evolution of the assembly size estimated from the captured images. I = incubation, S = saturation tendency, R = rapid enlargement, D = disappearance.

[*] Dr. K. Yuyama, Prof. T. Sugiyama, Prof. H. Masuhara

Angew Chem. Int. Ed., 2017, 56, 6737-6743

THE JOURNAL OF PHYSICAL CHEMISTRY

Article

Femtosecond Laser Trapping Dynamics of Nanoparticles: A Single Transient Assembly Formation Leading to Their Directional Ejection

Wei-Yi Chiang,[†,‡] Anwar Usman,[*,‡] Teruki Sugiyama,[*,†,∥] Johan Hofkens,[*,§] and Hiroshi Masuhara[*,†]

[†]Department of Applied Chemistry, College of Science, National Chiao Tung University, 1001 Ta Hsueh Road, Hsinchu 30010, Taiwan

[‡]Department of Chemistry, Faculty of Science, Universiti Brunei Darussalam, Jalan Tungku Link, Gadong BE1410, Negara Brunei Darussalam

[§]Single Molecule Unit, Department of Chemistry, Katholieke Universiteit Leuven, Celestijnenlaan 200F, 3001 Heverlee, België

[∥]Graduate School of Materials Science, Nara Institute of Science and Technology, 8916-5 Takayama-cho, Ikoma, Nara 630-0192, Japan

Supporting Information

ABSTRACT: We investigated femtosecond laser trapping dynamics of silica nanoparticles with different hydrophobic surface properties. We demonstrated that the hydrophobic surface on the silica nanoparticles facilitates mutual association of the nanoparticles in the optical trapping site. Such association of optically trapped nanoparticles is a prerequisite to induce their directional ejection away from the trapping site. The directional ejection of the optically trapped nanoparticles is most probably due to asymmetric three-dimensional ejecting forces generated by the electromagnetic interaction between transient assembly in the focal spot and the incident pulses. These findings provide important insights into the directional ejection of nanoparticles from the trapping site in the femtosecond laser trapping, and this physicochemical phenomenon is controlled by both the trapping laser and material properties.

J. Phys. Chem. C, 2018, in press

Research Article | Vol. 25, No. 5 | 6 Mar 2017 | OPTICS EXPRESS 4655

Optics EXPRESS

Resonance optical trapping of individual dye-doped polystyrene particles with blue- and red-detuned lasers

TETSUHIRO KUDO,[1,3] HAJIME ISHIHARA,[2] AND HIROSHI MASUHARA[1,4]

[1]*Department of Applied Chemistry, College of Science, National Chiao Tung University, Hsinchu 30010, Taiwan*

[2]*Department of Physics and Electronics, Osaka Prefecture University, Sakai, Osaka 599-8531, Japan*

[3]*kudo@nctu.edu.tw*

[4]*masuhara@masuhara.jp*

Abstract: We demonstrate resonance optical trapping of individual dye-doped polystyrene particles with blue- and red-detuned lasers whose energy are higher and lower compared to electronic transition of the dye molecules, respectively. Through the measurement on how long individual particles are trapped at the focus, we here show that immobilization time of dye-doped particles becomes longer than that of bare ones. We directly confirm that the immobilization time of dye-doped particles trapped by the blue-detuned laser becomes longer than that by the red-detuned one. These findings are well interpreted by our previous theoretical proposal based on nonlinear optical response under intense laser field. It is discussed that the present result is an important step toward efficient and selective manipulation of molecules, quantum dots, nanoparticles, and various nanomaterials based on their quantum mechanical properties.

OCIS codes: (140.7010) Laser trapping; (260.5740) Resonance; (350.4855) Optical tweezers or optical manipulation.

LANGMUIR

Article

pubs.acs.org/Langmuir

Femtosecond-Laser-Enhanced Amyloid Fibril Formation of Insulin

Tsung-Han Liu,[†] Ken-ichi Yuyama,[†,⊥] Takato Hiramatsu,[‡] Naoki Yamamoto,[‡] Eri Chatani,[‡,∥] Hiroshi Miyasaka,[§] Teruki Sugiyama,[*,†,∥] and Hiroshi Masuhara[*,†]

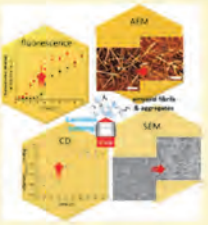
[†]Department of Applied Chemistry, National Chiao Tung University, Hsinchu 30010, Taiwan

[‡]Department of Chemistry, Graduate School of Science, Kobe University, Kobe, Hyogo 657-8501, Japan

[§]Division of Frontier Materials Science and Center for Promotion of Advanced Interdisciplinary Research, Graduate School of Engineering Science, Osaka University, Toyonaka, Osaka 560-8531, Japan

[∥]Graduate School of Materials Science, Nara Institute of Science and Technology, Ikoma, Nara 630-0192, Japan

ABSTRACT: Femtosecond (fs)-laser-induced crystallization as a novel crystallization technique was proposed for the first time by our group, where the crystallization time can be significantly shortened under fs laser irradiation. Similarly, we have further extended our investigation to amyloid fibril formation, also known as a nucleation-dependence process. Here we demonstrate that the necessary time for amyloid fibril formation can be significantly shortened by fs laser irradiation, leading to favorable enhancement. The enhancement was confirmed by both spectral measurements and direct observations of amyloid fibrils. The thioflavin T fluorescence intensity of laser-irradiated solution increased earlier than that of the control solution, and such a difference was simultaneously revealed by ellipticity changes. At the same time before intensity saturation in fluorescence, the number of amyloid fibrils obtained under laser irradiation was generally more than that in the control solution. Besides, such an enhancement is correlated to the laser power threshold of cavitation bubbling. Possible mechanisms are proposed by referring to fs-laser-induced crystallization and ultrasonication-induced amyloid fibril formation.



Langmuir, 2017, 33 (33), 8311–8318

THE JOURNAL OF PHYSICAL CHEMISTRY C

Article

pubs.acs.org/JPCC

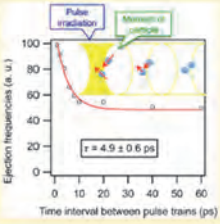
Picosecond Motional Relaxation of Nanoparticles in Femtosecond Laser Trapping

Masayasu Muramatsu,[*,†,§] Tse-Fu Shen,[†] Wei-Yi Chiang,[†] Anwar Usman,[‡] and Hiroshi Masuhara[*,†]

[†]Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan

[‡]Department of Chemistry, Faculty of Science, Universiti Brunei Darussalam, Jalan Tungku Link, Gadong BE1410, Negara Brunei Darussalam

ABSTRACT: Repetitive drag and release dynamics by impulsive force is characteristic of optical trapping by femtosecond laser pulses. We studied the dynamics utilizing double pulse train and found that trapped polystyrene particles are ejected repetitively from the focal spot and its frequencies become less for longer interval of the pulse trains. The ejection changes drastically in a few-ps interval region, although particles cannot move appreciable distance in such a short time. It means that displacement of particles by a conventional diffusive motion is not dominant and another fast process has an important role in femtosecond pulse trapping. We also revealed that the silica nanoparticles shows a decay at few-ps, indicating that the picosecond decay is not due to a material property but considered to be a general dynamics. We propose that a picosecond relaxation process of inertia force of particles is important for understanding laser trapping dynamics by femtosecond laser pulses.



J. Phys. Chem. C, 2016, 120(9), 5251-5256

LANGMUIR

Article

pubs.acs.org/Langmuir

Optically Evolved Assembly Formation in Laser Trapping of Polystyrene Nanoparticles at Solution Surface

Shun-Fa Wang,[†] Tetsuhiro Kudo,[†] Ken-ichi Yuyama,[*,†] Teruki Sugiyama,[‡,†] and Hiroshi Masuhara[*,†]

[†]Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan

[‡]Graduate School of Materials Science, Nara Institute of Science and Technology, Ikoma, Nara 630-0192, Japan

Supporting Information

ABSTRACT: Assembling dynamics of polystyrene nanoparticles by optical trapping is studied with utilizing transmission/reflection microscopy and reflection microspectroscopy. A single nanoparticle assembly with periodic structure is formed upon the focused laser irradiation at solution surface layer and continuously grows up to a steady state within few minutes. By controlling nanoparticle and salt concentrations in the colloidal solution, the assembling behavior is obviously changed. In the high concentration of nanoparticles, the assembly formation exhibits fast growth, gives large saturation size, and leads to dense packing structure. In the presence of salt, one assembly with the elongated aggregates was generated from the focal spot and 1064 nm trapping light was scattered outwardly with directions, while a small circular assembly and symmetrical expansion of the 1064 nm light were found without salt. The present nanoparticle assembling in optical trapping is driven through multiple scattering in gathered nanoparticles and directional scattering along the elongated aggregates derived from optical association of nanoparticles, which dynamic phenomenon is called optically evolved assembling. Repetitive trapping and release processes of nanoparticles between the assembly and the surrounding solution always proceed, and the steady state at the circular assembly formed by laser trapping is determined under optical and chemical equilibrium.

Langmuir, 2016, 32, 12488-12496

NANO LETTERS

Letter

pubs.acs.org/NanoLett

Optical Trapping-Formed Colloidal Assembly with Horns Extended to the Outside of a Focus through Light Propagation

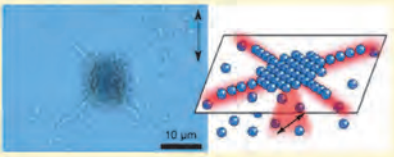
Tetsuhiro Kudo,* Shun-Fa Wang, Ken-ichi Yuyama, and Hiroshi Masuhara*

Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan

Supporting Information

ABSTRACT: We report optical trapping and assembling of colloidal particles at a glass/solution interface with a tightly focused laser beam of high intensity. It is generally believed that the particles are gathered only in an irradiated area where optical force is exerted on the particles by laser beam. Here we demonstrate that, the propagation of trapping laser from the focus to the outside of the formed assembly leads to expansion of the assembly much larger than the irradiated area with sticking out rows of linearly aligned particles like horns. The shape of the assembly, its structure, and the number of horns can be controlled by laser polarization. Optical trapping study utilizing the light propagation will open a new avenue for assembling and crystallizing quantum dots, metal nanoparticles, molecular clusters, proteins, and DNA.

KEYWORDS: *Optical trapping, colloidal assembly, light propagation, optical binding, glass/solution interface*



Nano Lett., 2016, 16(5), 3058-3062

CRYSTAL GROWTH & DESIGN

Cryst. Growth Des., 2016, 16(2), 953-960

pubs.acs.org/crystal

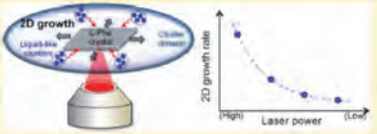
Two-Dimensional Growth Rate Control of L-Phenylalanine Crystal by Laser Trapping in Unsaturated Aqueous Solution

Ken-ichi Yuyama,[†] Jino George,[‡] K. George Thomas,[‡] Teruki Sugiyama,*[,†] and Hiroshi Masuhara*[,†]

[†]Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan
[‡]School of Chemistry, Indian Institute of Science Education and Research, Thiruvananthapuram, 695016, India

Supporting Information

ABSTRACT: The growth rate control of single L-phenylalanine plate-like anhydrous crystal is successfully demonstrated by laser trapping at an air/solution interface of the unsaturated aqueous solution. Focusing a continuous-wave near-infrared laser beam into the interface generates single L-phenylalanine crystal at the focal spot even under unsaturated condition. Subsequently, the plane area of the generated crystal becomes larger linearly with time under continued laser irradiation into the crystal central part. Two-dimensional crystal growth rate defined as a slope of the temporal change in the crystal plane area strongly depends on initial solution concentration as well as irradiation time until single crystal formation is confirmed by eye under a microscope. When the laser power is decreased after the crystallization, the growth rate is slowed down accordingly. Thus, the two-dimensional growth rate is arbitrarily controlled by tuning the laser power. As the critical phenomenon underlying the crystal growth, we propose that a dense domain consisting of a large number of the liquid-like clusters is formed prior to the crystallization. The dynamics and mechanism of the two-dimensional crystal growth is discussed by considering the supply of the solutes to the crystal edge from the cluster domain dependent on the laser power.



CRYSTAL GROWTH & DESIGN

Cryst. Growth. Des., 2015, 15(20), 4760-4767

pubs.acs.org/crystal

Dynamics and Mechanism of Laser Trapping-Induced Crystal Growth of Hen Egg White Lysozyme

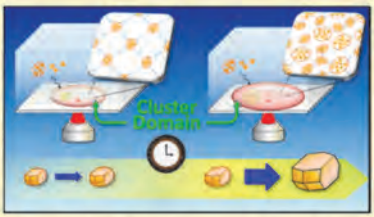
Published as part of the Crystal Growth & Design virtual special issue of selected papers presented at the 11th International Workshop on the Crystal Growth of Organic Materials (CGOM11 Nara, Japan), a joint meeting with Asian Crystallization Technology Symposium (ACTS 2014)

Jing-Ru Tu,[†] Ken-ichi Yuyama,*[,†] Hiroshi Masuhara,*[,†] and Teruki Sugiyama*[,†,‡]

[†]Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan
[‡]Instrument Technology Research Center, National Applied Research Laboratories, Hsinchu 30076, Taiwan

Supporting Information

ABSTRACT: We propose the dynamics and mechanism of laser trapping-induced crystal growth of hen egg-white lysozyme (HEWL). A continuous-wave near-infrared laser beam is used as a trapping light source and focused at a point 10 μm away from a target tetragonal HEWL crystal that is spontaneously generated in solution. Laser trapping of HEWL liquid-like clusters in solution increases local concentration in the focus, where the free motion and orientation of the clusters are strongly restricted, and the clusters show high rigidity and ordering. The cluster association and reorientation at the micrometer-sized focus is evolved to a large highly concentrated domain of the clusters, where the specific target crystal is grown. Initially, the high rigidity and ordering of the clusters strongly suppress the crystal grow rate compared to spontaneous crystal growth. Continuous laser trapping at the focus of the initially formed domain, however, leads to the transition to another domain with different concentration, rigidity, and ordering of the clusters, which surprisingly enhances the crystal growth rate. More interestingly, the clusters in both domains have anisotropic features reflecting the laser polarization direction, which also contributes to the crystal growth.



THE JOURNAL OF PHYSICAL CHEMISTRY Letters

Letter

pubs.acs.org/JPCL

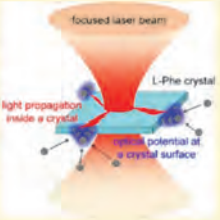
Laser Trapping and Crystallization Dynamics of L-Phenylalanine at Solution Surface

Ken-ichi Yuyama,[†] Teruki Sugiyama,[*,‡] and Hiroshi Masuhara[*,†]

[†]Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan
[‡]Instrument Technology Research Center, National Applied Research Laboratories, Hsinchu 30076, Taiwan

Supporting Information

ABSTRACT: We present laser trapping behavior of L-phenylalanine (L-Phe) at a surface of its unsaturated aqueous solution by a focused continuous-wave (CW) near-infrared (NIR) laser beam. Upon the irradiation into the solution surface, laser trapping of the liquid-like clusters is induced concurrently with local laser heating, forming an anhydrous plate-like crystal at the focal spot. The following laser irradiation into a central part of the plate-like crystal leads to laser trapping at the crystal surface not only for L-Phe molecules/clusters but also for polystyrene (PS) particles. The particles are closely packed at crystal edges despite that the crystal surface is not illuminated by the laser directly. The molecules/clusters are also gathered and adsorbed to the crystal surface, leading to crystal growth. The trapping dynamics and mechanism are discussed in view of optical potential formed at the crystal surface by light propagation inside the crystal.



SECTION: Surfaces, Interfaces, Porous Materials, and Catalysis

J. Phys. Chem. Lett., 4(15), 2436-2440 (2013)

THE JOURNAL OF PHYSICAL CHEMISTRY C

Article

pubs.acs.org/JPCC

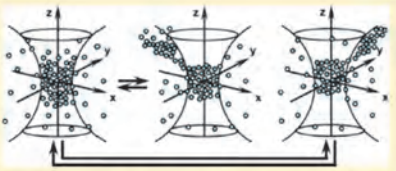
Femtosecond Pulse-Width Dependent Trapping and Directional Ejection Dynamics of Dielectric Nanoparticles

Wei-Yi Chiang,[†] Anwar Usman,[*,†,‡] and Hiroshi Masuhara[*,†]

[†]Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan
[‡]Solar and Photovoltaic Engineering Research Center, Division of Physical Sciences and Engineering, 3231-WS10 Level 3 Building 5, Thuwal 23955-6900, Saudi Arabia

Supporting Information

ABSTRACT: We demonstrate that laser pulse duration, which determines its impulsive peak power, is an effective parameter to control the number of optically trapped dielectric nanoparticles, their ejections along the directions perpendicular to polarization vector, and their migration distances from the trapping site. This ability to controllably confine and eject the nanoparticle is explained by pulse width-dependent optical forces exerted on nanoparticles in the trapping site and ratio between the repulsive and attractive forces. We also show that the directional ejections occur only when the number of nanoparticles confined in the trapping site exceeds a definite threshold. We interpret our data by considering the formation of transient assembly of the optically confined nanoparticles, partial ejection of the assembly, and subsequent filling of the trapping site. The understanding of optical trapping and directional ejections by ultrashort laser pulses paves the way to optically controlled manipulation and sorting of nanoparticles.



J. Phys. Chem. C, 117(37), 19182-19188 (2013)

ACCOUNTS
of chemical research

Laser Trapping Chemistry: From Polymer Assembly to Amino Acid Crystallization

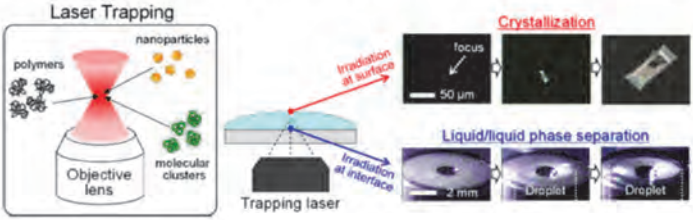
TERUKI SUGIYAMA,*,† KEN-ICHI YUYAMA,§ AND HIROSHI MASUHARA*,§

†Instrument Technology Research Center, National Applied Research Laboratories, Hsinchu 30076, Taiwan, and §Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan

RECEIVED ON MAY 29, 2012

CONSPECTUS

Spatiotemporally Controlled Nucleation and Growth by Laser Trapping



Acc. Chem. Res., 45, 11, 1946-1954 (2012)

THE JOURNAL OF PHYSICAL CHEMISTRY Letters

pubs.acs.org/JPCL

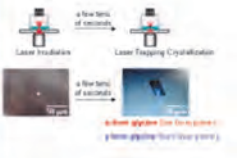
Control of Crystal Polymorph of Glycine by Photon Pressure of a Focused Continuous Wave Near-Infrared Laser Beam

Thitiporn Rungsimanon,† Ken-ichi Yuyama,† Teruki Sugiyama,*,† Hiroshi Masuhara,*,†,† Norimitsu Tohnai,§ and Mikiji Miyata§

†Graduate School of Materials Science, Nara Institute of Science and Technology, 8916-5 Takayama, Ikoma, Nara 630-0192, Japan, †Department of Applied Chemistry and Institute of Molecular Science, National Chiao Tung University, Hsinchu 30010, Taiwan, and §Department of Material and Life Science, Graduate School of Engineering, Osaka University, Suita 565-0871, Japan

ABSTRACT Crystal polymorph of glycine is controlled by tuning the power of a linearly polarized continuous wave 1064-nm laser beam. Upon focusing the beam to the air/solution interface of a supersaturated glycine/D_2O solution, its single crystal is spatiotemporally formed at a focal spot within a few seconds to a few tens of seconds. Fourier transform infrared measurement and single-crystal X-ray crystallographic analysis of the fabricated single crystal reveal that two polymorphs of α- and γ-forms are prepared depending on the laser power. The probability of γ-form preparation, which is not available under ambient conditions, arises up to 50% at 1.3 W laser power after an objective lens. The mechanism of the polymorph control is discussed in view of both photon pressure and local temperature elevation due to laser irradiation at the focal spot.

SECTION Nanoparticles and Nanostructures



J. Phys. Chem. Lett., 2010, 1, 599-603