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理化学研究所  
環境資源科学研究センター  
バイオ高分子研究チーム

研究分野：高分子化学（機能性高分子合成、バイオ高分子）

### 学歴 / 職歴

2002年3月	東京工業大学 工学部高分子工学科 卒業
2004年3月	東京工業大学大学院 理工学研究科有機・高分子物質専攻 修士課程修了
2004年6月～2005年6月	Department of Material Science and Engineering, Cornell University 訪問研究員 (Christopher K. Ober's group)
2007年3月	東京工業大学大学院 理工学研究科有機・高分子物質専攻 博士課程修了 指導教員：上田充教授
2004年4月～2007年2月	日本学術振興会 特別研究員 (DC1)
2007年3月～2012年3月	東京農工大学 生物システム応用科学府 (BASE) 助教
2012年4月～2013年8月	近畿大学 分子工学研究所 助教
2013年11月～2015年3月	神奈川大学 工学部 博士研究員
2015年4月～	理化学研究所 環境資源科学研究センター バイオ高分子研究チーム（前：酵素研究チーム） 上級研究員
2016年10月～	滋賀医科大学 客員准教授（兼務）
2017年1月～	ERATO 沼田オルガネラ反応クラスタープロジェクト 融合ペプチドグループ グループリーダー

### 論文

77	Yang, K.; Yazawa, K.; Tsuchiya, K.; Numata, K., Molecular interactions and toughening mechanism in silk fibroin-epoxy resin blend films. <i>Biomacromolecules</i> 2019, accepted.
76	Gimenez-Dejoz, J.; Tsuchiya, K.; Numata, K., Quantum mechanics/molecular mechanics simulation studies on the papain-mediated chemoenzymatic polymerization of L- and D-amino acid stereoisomers. <i>ACS Chem. Biol.</i> 2019, accepted.
75	Tsuchiya, K.; Ifuku, N.; Koyama, Y.; Numata, K., Development of regenerated silk films coated with fluorinated polypeptides to achieve high water repellency and biodegradability in seawater. <i>Polym. Degrad. Stab.</i> 2019, 160, 96-101.
74	Miyamoto, T.; Tsuchiya, K.; Numata, K., Block copolymer/plasmid DNA micelles postmodified with functional peptides via thiol-maleimide conjugation for efficient gene delivery into plants.

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- 72 Tsuchiya, K.; Ishii, T.; Masunaga, H.; Numata, K., Spider dragline silk composite films doped with linear and telechelic polyalanine: Effect of polyalanine on the structure and mechanical properties. *Sci. Rep.* 2018, 8, 3654.
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- 69 Tsuchiya, K.; Numata, K., Chemoenzymatic synthesis of polypeptides containing the unnatural amino acid 2-aminoisobutyric acid. *Chem. Commun.* 2017, 53, 7318-7321.
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- 54 Tsuchiya, K.; Endo, T., Synthesis of methacrylate polymer bearing cyanate groups and its chemoselective reaction with amines. *J. Polym. Sci. Part A: Polym. Chem.* 2014, 52, 699-706.
- 53 Yamazaki, S.; Matsumoto, K.; Ozaki, H.; Endo, O.; Ogino, K.; Tsuchiya, K.; Hasegawa, M.; Mazaki, Y., Electron Spectroscopy of Ultrathin Cycloalkane Films on Graphite (0001): Molecular Orbitals, Conformation, and Orientation. *Chem. Lett.* 2013, 42, 1048-1050.
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- 51 Natori, I.; Natori, S.; Kanasashi, A.; Tsuchiya, K.; Ogino, K., Synthesis of fac-Ir(ppy)(3) end-functionalized poly(4-diphenylaminostyrene) using fac-Ir(ppy)(2)(vppy) as a single-monomer addition reagent. *Polym. J.* 2013, 45, 601-605.
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- Carboxylic Acid - Rapid Isomerization and Kinetically Selective Hydrolysis. *Int. J. Org. Chem.* 2012, 2, 26-30.
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- 20 Natori, I.; Natori, S.; Sekikawa, H.; Takahashi, T.; Ogino, K.; Tsuchiya, K.; Sato, H., Poly(4-diphenylaminostyrene) with a well-defined polymer chain structure: Controllable optical and electrical properties. *Polymer* 2010, 51, 1501-1506.
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- 18 Tsuchiya, K.; Shimomura, T.; Ogino, K., Preparation of diblock copolymer based on poly(4-*n*-butyltriphenylamine) via palladium coupling polymerization. *Polymer* 2009, 50, 95-101.
- 17 Kanao, M.; Otake, A.; Tsuchiya, K.; Ogino, K., Stereo-Selective Synthesis of exo-Norbornene Derivatives for Resist Materials. *J. Photopolym. Sci. Technol.* 2009, 22, 365-370.
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- 12 Fujioka, M.; Kurihara, H.; Kawamura, R.; Sato, H.; Tsuchiya, K.; Ogino, K., Preparation of poly(4-butyltriphenylamine) particles by chemical oxidative dispersion polymerization. *Colloid Polym. Sci.* 2008, 286, 313-318.
- 11 Tsuchiya, K.; Shibasaki, Y.; Ueda, M., A negative type photosensitive polymer based on poly(naphthylene ether), a cross-linker, and a photoacid generator with low dielectric constant. *Polym. J.* 2007, 39, 442-447.
- 10 Mizoguchi, K.; Tsuchiya, K.; Shibasaki, Y.; Ueda, M., A negative-type photosensitive polymer based on poly(2,6-dimethyl-1,4-phenylene ether), a cross-linker and a photoacid generator. *J. Photopolym. Sci. Technol.* 2007, 20, 187-188.
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- 7 Felix, N. M.; Tsuchiya, K.; Ober, C. K., High-resolution patterning of molecular glasses using supercritical carbon dioxide. *Adv. Mater.* 2006, 18, 442-446.

6	Tsuchiya, K.; Chang, S. W.; Felix, N. M.; Ueda, M.; Ober, C. K., Lithography based on molecular glasses. <i>J. Photopolym. Sci. Technol.</i> 2005, 18, 431-434.
5	Tsuchiya, K.; Shibasaki, Y.; Ueda, M., A positive type alkaline developable thermally stable and photosensitive polymer based on partially O-methylated poly (2,6-dihydroxy-1,5-naphthylene), an acidolytic de-cross-linker, and a photoacid generator. <i>Polymer</i> 2004, 45, 6873-6878.
4	Tsuchiya, K.; Shibasaki, Y.; Suzuki, M.; Ueda, M., Three-component, negative-type, alkaline-developable, thermally stable, and photosensitive polymer based on poly(2,6-dihydroxy-1,5-naphthalene), a crosslinker, and a photoacid generator. <i>J. Polym. Sci. Part A: Polym. Chem.</i> 2004, 42, 2235-2240.
3	Tsuchiya, K.; Ishii, H.; Shibasaki, Y.; Ando, S.; Ueda, M., Synthesis of a novel poly(binaphthylene ether) with a low dielectric constant. <i>Macromolecules</i> 2004, 37, 4794-4797.
2	Tsuchiya, K.; Shibasaki, Y.; Ueda, M., Tandem type polymerization. Synthesis and characterization of ordered poly(amide-thioether) from 2,6-dichlorophenyl methacrylate, 4,4'-thiobis(benznenethiol), and 4,4'-oxydianiline. <i>Macromolecules</i> 2003, 36, 1815-1818.
1	Tsuchiya, K.; Shibasaki, Y.; Suzuki, M.; Ueda, M., A new negative-type photosensitive polymer based on poly(2,6-dihydroxy-1,5-naphthalene), a cross-linker, and a photoacid generator. <i>J. Photopolym. Sci. Technol.</i> 2003, 16, 285-286.

## 著書

2	Tsuchiya, K., Miyagi, Y., Miyamoto, T.; Gudeangadi, P. G.; Numata, K., Chapter 8. Synthesis of polypeptides. ed. by Kobayashi, S.; Uyama, H.; Kadokawa, J. <i>Green Chemistry and Sustainable Technology: Enzymatic Polymerization towards Green Polymer Chemistry</i> , Springer, 2019, 233-266.
1	Tsuchiya, K.; Numata, K., Chapter 7. Protease-catalyzed polymerization of tripeptide esters containing unnatural amino acids: $\alpha,\alpha$ -Disubstituted and <i>N</i> -alkylated amino acids. ed. by Cheng, H. N.; Gross, R. A.; Smith, P. B. <i>Green Polymer Chemistry: New Products, Processes and Applications</i> , American Chemical Society, 2018, 95-105.

## 解説

8	土屋康佑、沼田圭司、「プロテアーゼを利用した構造タンパク質モチーフの化学合成—簡便かつグリーンなポリペプチド合成法—」 <i>化学と生物</i> 2019, 57, 76-77.
7	土屋康佑、沼田圭司、「化学酵素重合を利用した機能性ポリペプチドの合成」 <i>化学工業</i> 2018, 69, 929-934.
6	土屋康佑、沼田圭司、「化学酵素重合法”による高機能タンパク質素材の合成」 <i>バイオサイエンスとインダストリー</i> 2018, 76, 386-389.
5	沼田圭司、土屋康佑、児玉豊、「オルガネラ反応クラスターが切り拓くバイオマス社会」 <i>植物の生長調節</i> 2018, 53, 80-83.
4	土屋康佑、沼田圭司、「クモ糸の分子構造を模倣する酵素を利用した天然タンパク質モチーフの化学合成」 <i>フレグラランスジャーナル</i> 2018, 6月号, 46-50.
3	土屋康佑、「化学合成手法によるクモ糸を模倣したポリペプチド材料の開発」 <i>化学経済</i> 2017, 7月号, 30-

	35.
2	土屋康佑、沼田圭司、「化学酵素重合による天然を模倣したポリペプチド材料の合成」 化学と工業 2017, 70, 485-487.
1	土屋康佑、「低誘電率絶縁膜の開発」 化学と教育 2007, 55, 452-453.

## 招待講演

11	2019年5月	土屋康佑、"酵素合成によるクモ糸シルクタンパク質を模倣したポリペプチド材料の合成"、技術情報協会セミナー
10	2018年10月	土屋康佑、"化学酵素重合によるクモ糸タンパク質の構造を模倣したポリペプチド材料の創製"、近畿化学協会
9	2018年10月	Kousuke Tsuchiya, "Chemoenzymatic synthesis of functional polypeptides", SmaSys2018,
8	2018年2月	土屋康佑、"酵素を用いた機能性ポリペプチド合成法の開発 ~環境低負荷型のバイオ材料合成~"、理研イブニングセミナー
7	2017年10月	土屋康佑、"ポリペプチド合成の基礎と最新動向 ~構造タンパク質材料の開発、大量合成とその特性・評価、応用技術~"、情報機構セミナー
6	2017年8月	Kousuke Tsuchiya, Keiji Numata, "Chemoenzymatic polymerization of unnatural amino acids", 254th ACS National Meeting
5	2016年2月	土屋康佑、"酵素重合を利用した構造タンパク材料の開発"、日本素材物性学会研究会
4	2014年8月	土屋康佑、"機能性ブロックコポリマーによる多機能性多相系材料の開発"、関東高分子若手研究会・サマーキャンプ 2014
3	2012年6月	土屋康佑、"有機薄膜デバイスの高性能化を目指した電荷輸送性ブロックコポリマーの合成"、九州地区高分子若手研究会・夏の講演会
2	2010年3月	Kousuke Tsuchiya, "Charge transporting polymer architectures based on poly(triphenylamine)", Korea-Japan Young Scientist Symposium
1	2010年5月	土屋康佑、"トリフェニルアミン系ブロックコポリマーの合成と光電変換素子への応用"、繊維学会若手研究者講演会

## 受賞

3	平成30年度繊維学会年次大会 優秀口頭発表賞	繊維学会	2018
2	CSRS Incentive Award	理化学研究所	2018
1	平成23年度高分子研究奨励賞	高分子学会	2012

## 研究費

5	理化学研究所 第3回産業連携促進費「非天然アミノ酸構造を持つマルチブロックポリペプチド材料の合成」研究代表 (2017年度)
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4	科学研究費 若手研究(B) 「酵素触媒フラグメント合成を用いた高強度バイオポリアミドの開発」研究代表 (2017 年度～2018 年度)
3	科学研究費 若手研究 B 「ブロック共重合体を用いたドメイン配向制御と機能分離による高効率薄膜太陽電池の開発」研究代表 (2012 年度～2013 年度)
2	JST 地域イノベーション創出総合支援事業 シーズ発掘試験「環状トリアリールアミン包接錯体によるシリンダー構造を利用した光電変換素子の開発」研究代表 (2008 年度)
1	科学研究費 特別研究員奨励費「低誘電率、低誘電正接を有する次世代感光性有機層間絶縁膜の開発」 研究代表 (2004 年度～2006 年度)