

第20回生体触媒化学シンポジウム

The 20th Biocatalysis Symposium of Japan

December 12-13, 2018

Tokyo Institute of Technology Suzukakedai Campus, Yokohama



Program

Time	Agenda	Place
Wednesday, December 12, 2018		
11:30-13:00	受付 Reception	多目的ホール 入口付近 Foyer
13:00-13:05	開会式 Opening Remarks Dr. Yoshihiko Hirose (Enzyme Techno)	多目的ホール Large Multipurpose Hall
Session 1 Chair : Prof. Nobuya Itoh (Toyama Prefectural University)		
13:05-14:05	基調講演 Plenary Lecture 1 Dr. John W. Wong Pfizer Worldwide Research & Development Development of a Chemoenzymatic Process for a Gamma Secretase Modulator (PF-06648671)	
14:05-15:05	基調講演 Plenary Lecture 2 Dr. Satoshi Koikeda Gifu R&D Center, Amano Enzyme Inc. <i>The wild type is not enough</i> -Protein engineering of lipase for improving enzyme performance -	
Poster Session		
15:10-15:55	ポスターセッション 1 奇数 Poster session 1 (odd-numbered)	ラウンジ Lounge
15:55-16:40	ポスターセッション 2 偶数 Poster session 2 (even-numbered)	
Session 2 Chair : to be decided		
16:45-17:45	基調講演 Plenary Lecture 3 Dr. David Entwistle Process Chemistry, Codexis Inc. The Evolution of Biocatalysis. Adventures in Directed Evolution	多目的ホール Large Multipurpose Hall
17:45-18:00	集合写真撮影 Group Photo	
18:00-19:45	懇親会 Mixer	ラウンジ Lounge
20:30	二次会 After-party	青葉台 フォーラム Aobadai Forum

Thursday, December 13, 2018		
Session 3 Chair : Prof. Takeshi Sugai (Keio University)		多目的ホール Large Multipurpose Hall
09:00-10:00	基調講演 Plenary Lecture 4 : Prof. Ikuro Abe Graduate School of Pharmaceutical Sciences, The University of Tokyo Unusual Enzyme Reactions in Natural Product Biosynthesis	
10:00-11:00	基調講演 Plenary Lecture 5 : Prof. Dr. Harald Gröger Chair of Organic Chemistry I, Faculty of Chemistry, Bielefeld University Enzymes in Organic Chemistry: From Efficient Synthesis towards Chemoenzymatic One-Pot Processes	
11:00-11:30	休憩 Coffee break	ラウンジ Lounge
Session 4 Chair : Prof. Rio Yamanaka (Himeji Dokkyo University)		多目的ホール Large Multipurpose Hall
11:30-11:50	口頭発表 Oral Lecture 1 : ○Makoto Furukawa, Norifumi Kawakami and Kenji Miyamoto Department of Biosciences and Informatics, Keio University Efficient enzymatic degradation of poly(ethylene terephthalate) using amphiphilic molecules	
11:50-12:10	口頭発表 Oral Lecture 2 : ○Takeshi Sugai, Riichi Hashimoto, Ayaka Sakakura, Kengo Hanaya, Shuhei Higashibayashi Department of Pharmaceutical Sciences, Faculty of Pharmacy, Keio University Lipase-catalyzed site-selective deacetylation of sterically hindered polyphenol acetates and its application to the synthesis of bioactive natural products	
12:10-12:30	口頭発表 Oral Lecture 3 : ○Kengo Kasama ¹ , Koichi Higashio ¹ , Gamal A. I. Moustafa ^{1,2} , Shuji Akai ¹ ¹ Graduate School of Pharmaceutical Sciences, Osaka University, ² Department of Medicinal Chemistry, Faculty of Pharmacy, Minia University, Egypt Base-promoted lipase-catalyzed kinetic resolution of atropisomeric 1,1'-biaryl-2,2'-diols	
12:30-13:45	昼休み Lunch Break	

Session 5 Chair : Prof. Toshiyuki Itoh (Tottori University)		
13:45-14:45	<p>基調講演 Plenary Lecture 6 : Prof. Dr. Zhi Li Department of Chemical & Biomolecular Engineering, National University of Singapore Engineering biocatalytic cascade reactions for green and selective chemical synthesis</p>	<p>多目的ホール Large Multipurpose Hall</p>
14:45-15:15	<p>休憩 Coffee Break</p>	<p>ラウンジ Lounge</p>
Session 6 Chairs : Prof. Hiroshi Kanzaki (Okayama University) Prof. Yumiko Takagi (Kagawa University)		
15:15-16:15	<p>基調講演 Plenary Lecture 7 Prof. Dr. Romas Kazlauskas Department of Biochemistry, Molecular Biology and Biophysics, University of Minnesota How Esterases Evolved into Hydroxynitrile Lyases</p>	
16:15-16:35	<p>口頭発表 Oral Lecture 4 : ○Ki-Seok Yoon^{1,2} and Seiji Ogo^{1,2} ¹International Institute for Carbon-Neutral Energy Research (WPI-I2CNER), Kyushu University ²Department of Chemistry and Biochemistry, Graduate School of Engineering, Kyushu University New [NiFe]hydrogenase running activity between H₂ and O₂ molecules</p>	
16:35-16:55	<p>口頭発表 Oral Lecture 5 : ○Nobuya Itoh and Hiroshi Toda Biotechnology Research Center and Department of Biotechnology, Toyama Prefectural University Production of the drug candidates indirubin derivatives and epitheaflagallin 3-<i>O</i>-gallate (ETFGg) by the oxidative reactions of styrene monooxygenase and laccase</p>	<p>多目的ホール Large Multipurpose Hall</p>
16:55-17:15	<p>口頭発表 Oral Lecture 6 : ○Koesoema, Afifa Ayu¹, Sugiyama, Yosuke¹, Verina, Samantha¹, T.Sriwong, Kotchakorn¹, Yamashita, Kazuo², Schritt, Dimitri², Standley, Daron M.², Senda, Miki³, Senda, Toshiya³, Matsuda, Tomoko¹ ¹School of Life Science and Technology, Tokyo Institute of Technology, ²Research Institute of Microbial Disease, Osaka University, ³Institute of Materials Structure Science, High Energy Accelerator Research Organization Structure-function relationship of Prelog wild type and anti-Prelog mutant variants of acetophenone reductase from <i>Geotrichum candidum</i> NBRC 4597</p>	
17:15-17:20	<p>閉会式 Closing Remarks Prof. Tomoko Matsuda (Tokyo Institute of Technology)</p>	

Poster list

P-01

Introduction of Daicel's biotransformation technologies

○Motoko Hayashi, Hiroaki Yamamoto

Corporate Research Center, R&D Headquarters, Daicel Corporation

○林素子, 山本浩明

ダイセルのバイオ技術の紹介

株式会社ダイセル

P-02

Protein engineering of *Candida rugosa* lipase for improving enzyme performance

○Satoru Ishihara, Kazunori Yoshida, Tetsuya Takahashi, Satoshi Koikeda

Gifu R&D Center, Amano Enzyme Inc.

P-03

Soluble protein expression for screening of thermostable poly(ethylene terephthalate) hydrolase mutants

○Naoya Ohara, Norifumi Kawakami, Kenji Miyamoto

Department of Biosciences and Informatics, Faculty of Science and Technology, Keio University

Poly(ethylene terephthalate)分解酵素の可溶化と熱安定性向上変異体のスクリーニング系構築

○大原直也, 川上了史, 宮本憲二

慶應義塾大学 理工学部 生命情報学科

P-04

Degradation of poly (ethylene terephthalate) by thermostable PET hydrolase in the presence of surfactant

○Atsushi Tomizawa, Makoto Furukawa, Norifumi Kawakami, Kenji Miyamoto

Department of Biosciences and Informatics, Faculty of Science and Technology, Keio University

界面活性剤存在下での耐熱性酵素による poly(ethylene terephthalate) の分解

○富沢温, 古川洵, 川上了史, 宮本憲二

慶應義塾大学 理工学部 生命情報学科

P-05

Characterization of esterase LipP1 from extremely halophilic archaeon *Haloarcula japonica* and immobilization on a cationic copolymer

○Koji Abe, Shota Ambai, Hidehiro Ito, Fumiya Ikeda, Rie Yatsunami, Toshiaki Kamachi, Toshiaki Fukui, Satoshi Nakamura

School of Life Science and Technology, Tokyo Institute of Technology

高度好塩性古細菌 *Haloarcula japonica* 由来エステラーゼ LipP1 の酵素学的性質および高分子担体への固定化条件検討

○安部航司, 塩梅昇太, 伊藤栄紘, 池田郁也, 八波利恵, 蒲池利章, 福居俊昭, 中村聡

東京工業大学 生命理工学院

P-06

Synthesis of optically active lactones using lipase-catalyzed reaction

Daiki Kato¹, Yasuo Tanaka², Naoki Toyooka¹, ○Masashi Kawasaki,³

¹Graduate School of Science and Engineering, University of Toyama, ²Taiyo Corporation, ³Faculty of Engineering, Toyama Prefectural University

リパーゼ触媒反応利用した光学活性なラクトンの合成

加藤大騎¹, 田中康雄², 豊岡尚樹¹, ○川崎正志³

富山大学¹, 太洋株式会社², 富山県立大学³

P-07

Pressurized CO₂ as novel solvents for lipase-catalyzed esterification and epoxidation

Hai Nam Hoang¹, ○Henry Suryadinata¹, Shinjiro Yamada¹, Moeko Otsu¹, Ryudai Uike¹, Tomoko Matsuda¹, Emanuel Granero-Fernandez², Yaocihuatl Medina-Gonzalez²

¹School of Life Science and Technology, Tokyo Institute of Technology, ²Laboratoire de Génie Chimique, Université de Toulouse

P-08

Lipase-catalyzed *tert*-butoxycarbonylation using Boc₂O

○Naoki Kishi¹ and Hideo Kojima²

¹Department of Chemistry, School of Science, College of Life, Environment, and Advanced Sciences, Osaka Prefecture University, ²Department of Chemistry, Graduate School of Science, Osaka Prefecture University

P-09

Survey of microbial enzyme for deprotection of *N*-Cbz amino acid

○Yuta Fukawa, Hiroshi Kikukawa, Kouichi Mitsukura, Toyokazu Yoshida

Graduate School of Natural Science and Technology, Gifu University

N-Cbz-アミノ酸を脱保護する微生物酵素の探索

○府川祐太, 菊川寛史, 満倉浩一, 吉田豊和

岐阜大学 自然科学技術研究科

P-10

A comparative study of substrate specificity of three *p*-nitrophenyl β-D-glucopyranoside hydrolases from *Penicillium multicolor*

○Mana Koide, Shoko Sukanuma, Teruhiko Nitoda, Hiroshi Kanzaki

The Graduate School of Environmental and Life Science, Okayama University

Penicillium multicolor が生産する 3 種の *p*-nitrophenyl β-D-glucopyranoside 分解酵素の基質特異性に関する比較研究

○小出麻奈, 菅沼笙子, 仁戸田照彦, 神崎浩

岡山大学大学院 環境生命科学研究科

P-11

The biotransformation and enzymatic study of methyltransferase, and glucosyltransferase from *Phytolacca americana*

○Hiroki Hamada¹, Daisuke Uesugi¹, Yuya Fujitaka¹, Kei Shimoda², Shinichi Ozaki³, Toshiyuki Waki⁴, Toru Nakayama⁴, Yohta Fukuda⁵, Tsuyoshi Inoue⁵

¹Faculty of Science, Okayama University of Science, ²Faculty of Medicine, Oita University, ³Faculty of Agriculture, Yamaguchi University, ⁴Faculty of Engineering, Tohoku University, ⁵Faculty of Engineering, Osaka University

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Chemoenzymatic synthesis of gentianine *N*-oxide from gentiopicroside and swertiamarin and the reaction pathways

○Mikio Fujii¹, Taiki Kuramochi¹, Yuhi Nakakuki¹, Rina Hatazawa¹, Kiju Konno¹, and Yasuaki Hirai¹

¹School of Pharmacy, International University of Health and Welfare ²School of Education at Fujiyoshida, Showa University

P-13

Enzymatic glucosylation of functional healthcare compounds

○Yoshihiko Hirose¹, Antonio O. Ballesteros² and Francisco J. Plou².

¹Enzyme Techno, Gifu Pharmaceutical University, Gifu Japan ²Instituto de Catalisis y Petroleoquimica, CSIC, 28049 Madrid, Spain

P-14

Multi-domain glucoamylase Gla1 from extremely halophilic archaeon *Haloarcula japonica*: Function of additional domains and contribution on a glycogen-like α -glucan

○Yutaro Ogawa¹, Tatsuya Asahi¹, Mie Kiyohara¹, Kento Yoshida¹, Ryuichiro Suzuki², Eiji Suzuki², Toshiaki Fukui¹, Rie Yatsunami, Satoshi Nakamura¹

¹School of Life Science and Technology, Tokyo Institute of Technology, ²Faculty of Bioresource Sciences, Akita Prefectural University

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Expression and characterization of a GH5 xylanase from *Paenibacillus* sp. H2C

○Tomohiro Okeda¹, Yusuke Hagiwara^{1,2}, Kiseki Ito¹, Koichi Sakagami¹, Yasuhiro Mihara², Rie Yatsunami¹, Toshiaki Fukui¹, Satoshi Nakamura¹

¹School of Life Science and Technology, Tokyo Institute of Technology, ²Research Institute for Bioscience Products & Fine Chemicals, Ajinomoto Co., Inc.

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Cleavage specificities of GH10 xylanases from *Paenibacillus* sp. H2C

○Keiko Okuda¹, Bat-Erdene Undramaa¹, Yusuke Hagiwara^{1,2}, Koichi Sakagami¹, Yasuhiro Mihara², Rie Yatsunami¹, Toshiaki Fukui¹, Satoshi Nakamura¹

¹School of Life Science and Technology, Tokyo Institute of Technology, ²Research Institute for Bioscience Products & Fine Chemicals, Ajinomoto Co., Inc.

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Characterization and thermostabilization of GH30 xylanases from *Bacillus* and *Paenibacillus* spp.

○Tomoyuki Ohgoshi¹, Ryuta Sagara¹, Yusuke Hagiwara^{1,2}, Koichi Sakagami¹, Yasuhiro Mihara², Rie Yatsunami¹, Toshiaki Fukui¹, Satoshi Nakamura¹

¹School of Life Science and Technology, Tokyo Institute of Technology, ²Research Institute for Bioscience Products & Fine Chemicals, Ajinomoto Co., Inc.

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Characterization of *Escherichia coli*-produced GH43 and GH51 arabinofuranosidases from *Paenibacillus* sp. H2C

○Kiseki Ito¹, Ryuta Sagara¹, Yusuke Hagiwara^{1,2}, Ayaka Murase¹, Koichi Sakagami¹, Yasuhiro Mihara², Rie Yatsunami¹, Toshiaki Fukui¹, Satoshi Nakamura¹

¹School of Life Science and Technology, Tokyo Institute of Technology, ²Research Institute for Bioscience Products & Fine Chemicals, Ajinomoto Co., Inc.

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Introduction of modified purines into nucleosides using nucleic acid metabolizing enzymes

○Kou Suzuki¹, Hiroyuki Wakana², Yu Iiduka¹, Akihiko Hatano^{1,2}

¹School of Chemistry, Shibaura Institute of Technology ²Graduate School of Chemistry, Shibaura Institute of Technology

核酸代謝酵素を用いた修飾プリンのヌクレオシドへの導入

○鈴木康¹, 若菜浩幸², 飯塚佑¹, 幡野明彦^{1,2}

¹芝浦工業大学 応用化学科 ²芝浦工業大学大学院 理工学研究科 応用化学専攻

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Development of the imaging probe targeting for thymidine phosphorylase as angiogenic factor of cancer

○Hiroyuki Wakana, Akihiko Hatano

Department of Chemistry, Shibaura Institute of Technology

血管新生因子チミジンホスホリラーゼをターゲットとしたイメージング薬の開発

○若菜浩幸, 幡野明彦

芝浦工業大学大学院 理工学研究科 応用化学専攻

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Improvement of squalene production in extremely halophilic archaeon *Haloarcula japonica* by metabolic pathway engineering

○Risa Suzuki¹, Rie Yatsunami¹, Toshiyuki Takahashi², Toshiaki Fukui¹, Satoshi Nakamura¹

¹School of Life Science and Technology, Tokyo Institute of Technology, ²High Performance Materials Company, JXTG Nippon Oil & Energy Corporation

高度好塩性古細菌 *Haloarcula japonica* の代謝改変によるスクアレン生産の向上

○鈴木理紗¹, 八波利恵¹, 高橋季之², 福居俊昭¹, 中村聡¹

¹東京工業大学 生命理工学院 ²JXTG エネルギー株式会社 機能材カンパニー

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Alteration of C50 carotenoids biosynthetic pathway in extremely halophilic archaeon *Haloarcula japonica* toward creation of novel carotenoids

○Kazushi Kojima¹, Naoya Sano¹, Ai Ando¹, Ying Yang¹, Shinichi Takaichi², Rie Yatsunami¹, Toshiaki Fukui¹, Satoshi Nakamura¹

¹School of Life Science and Technology, Tokyo Institute of Technology, ²Faculty of Life Sciences, Tokyo University of Agriculture

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Construction of reverse β -oxidation pathway for supplying monomer units of polyhydroxyalkanoate copolymer in *Methylobacterium extorquens*

○Izumi Orita, Risa Kato, Gento Unno, Satoshi Nakamura, Toshiaki Fukui
School of Life Science and Technology, Tokyo Institute of Technology

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Utilization of single domain antibody for controlling the bioluminescent catalytic activity of firefly luciferase

○Atsuhiko Tsuruta¹, Dai-ichiro Kato¹, Kazunari Arima¹, Yuji Ito¹, Yoko Akazawa², Yoshihiro Nakajima²
¹Graduate School of Science and Engineering, Kagoshima University ²National Institute of Advanced Industrial Science and Technology

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Isolation and characterization of quercitol 1-dehydrogenase from *Burkholderia terrae* for production of (-)-vibo-quercitol

○Hiroshi Toda, Junji Kurokawa, Nobuya Itoh
Biotechnology Research Center and Department of Biotechnology, Toyama Prefectural University
○戸田弘, 黒川純司, 伊藤伸哉
富山県立大学 工学部 生物工学科 生物工学研究センター

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Search and identification of enzymes from *Saccharomyces cerevisiae* catalyzing the reduction of olive leaf secondary metabolite, 3,4-dihydroxyphenylethanol-elenolic acid

○Kana Matsukawa¹, Saori Makio¹, Teruhiko Nitoda¹, Hisao Moriya², Hiroshi Kanzaki¹
¹Graduate School of Environmental and Life Science, Okayama University ²Research Core for Interdisciplinary Sciences, Okayama University
オリーブ葉二次代謝産物 3,4-dihydroxyphenylethanol-elenolic acid の還元を触媒する *Saccharomyces cerevisiae* 由来酵素の探索と同定
○松川加奈¹, 巻尾沙織¹, 仁戸田照彦¹, 守屋央郎², 神崎浩¹
¹岡山大学大学院 環境生命科学研究科 ²岡山大学 異分野先端融合コア

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Synthesis of shikimic acid derivatives using *Arabidopsis thaliana*

○Takuma Tsuji¹, Hideo Kojima², Satomi Takeda²
¹Department of Chemistry, School of Science, College of Life, Environment, and Advanced Sciences, Osaka Prefecture University ²Graduate School of Science, Osaka Prefecture University

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Synthesis of Buddledone A by asymmetric reduction of zerumbone with a cyanobacterium

○Yoshimi Utaka¹, Rio Yamanaka², Masayo Kawasaka¹, Gengo Kashiwazaki¹, Takashi Kitayama¹
¹Graduate School of Agriculture, Kindai University, ²Faculty of Pharmaceutical Science, Himeji Dokkyo University
藍藻を用いたゼルンボンの不斉還元による Buddledone A の合成
○宇高芳美¹, 山中理央², 川阪昌代¹, 柏崎玄伍¹, 北山隆¹
¹近畿大学大学院 農学研究科 ²姫路獨協大学 薬学部

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Improvement of photobiocatalytic asymmetric reduction of the exogenous ketone by the alcohol-tolerant mutant of a cyanobacterium

○Rio Yamanaka¹, Mi Hwa Lee¹, Yuki Kanamoto², Sayuri Arai³, Kazunori Shimizu³, Hiroyuki Honda³, Akio Murakami²

¹Faculty of Pharmaceutical Science, Himeji Dokkyo University, ²Research Center for Inland Seas, Kobe University, ³Graduate School of Engineering, Nagoya University

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Effect of light on the asymmetric reduction of ketones using cyanobacteria

○Shusei Tanaka¹, Hideo Kojima², Satomi Takeda², Rio Yamanaka³, Tetsuo Takemura⁴, Kaoru Nakamura⁵

¹Department of Chemistry, School of Science, College of Life, Environment, and Advanced Sciences, Osaka Prefecture University, ²Graduate School of Science, Osaka Prefecture University, ³Faculty of Pharmaceutical Sciences, Himeji Dokkyo University, ⁴Faculty of Sciences, Josai University, ⁵Faculty of Human Development, Kobe University

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Chiralscreen[®] OH as a useful tool for asymmetric reduction of 1,3-dicarbonyl compounds

○Masahiro Okuyama, Ryuji Tsunekawa, Shunsuke Watanabe, Kazuaki Kuwata, Toshiya Nagai, Kengo Hanaya, Shuhei Higashibayashi, Takeshi Sugai

Faculty of Pharmacy, Keio University

1, 3-ジカルボニル化合物の不斉還元における Chiralscreen[®] OH の有効性

○奥山雅洋, 恒川龍二, 渡邊俊佑, 桑田和明, 永井利也, 花屋賢悟, 東林修平, 須貝威
慶應義塾大学 薬学部

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Effect of small binding pocket mutation on acetophenone reductase from *Geotrichum candidum* NBRC 4597 towards 2-tetralone derivatives

Afifa Ayu Koesoema, ○Kotchakorn T.Sriwong, Yosuke Sugiyama, Samantha Verina, Tomoko Matsuda
School of Life Science and Technology, Tokyo Institute of Technology

P-33

Catalytic activity of the alcohol dehydrogenase immobilized by the protein supramolecule, TIP60

○Yuki Matsuzawa, Norifumi Kawakami, Kenji Miyamoto

¹Department of Biosciences and Informatics, Keio University

球状タンパク質超分子 TIP60 を利用したアルコール脱水素酵素の固定化と活性評価

○松澤佑樹, 川上了史, 宮本憲二

慶大院 理工学研究科

P-34

Synthesis of chiral compounds by electroenzymatic reduction using electrode immobilizing enzyme
○Nobuki Sakurai¹, Eri Tanaka², Naoki Toujou², Kentarou Yoshida², Tetsuya Ono², Yoshitomo Kashiwagi²

¹JNC Co., Ltd. , ²School of Pharmaceutical Sciences, Ohu University

酵素電極を用いた電解還元反応によるキラル化合物の合成

○櫻井伸樹¹, 田中恵理², 東條直樹², 吉田健太郎², 小野哲也², 柏木良友²

¹JNC株式会社, ²奥羽大学 薬

P-35

Oxidation of aldehydes to carboxylic acids by *Geotrichum candidum* aldehyde dehydrogenase
Hoshino Tomoyasu, Emi Yamabe, ○M. Arisyi Hawari, Tamura Mayumi, Tomoko Matsuda
School of Life Science and Technology, Tokyo Institute of Technology

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Optimized direct enzymatic carboxylation of 2-ketoglutarate in supercritical CO₂ solvent

○Kristian Ray Angelo G. Are, Yusuke Koike, Mayumi Tamura, Tomoko Matsuda

Graduate School of Life Science and Technology, Tokyo Institute of Technology

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Expression of imine reductase gene in *Rhodococcus erythropolis* L88 cell and effective synthesis of chiral cyclic amine

○Keita Yoshida, Sayaka Degura, Hiroshi Kikukawa, Koichi Mitsukura, Toyokazu Yoshida

Gifu Graduate School of Natural Science and Technology

Rhodococcus erythropolis L88 を用いたイミン還元酵素遺伝子の発現と効率的なキラル環状アミンの合成

○吉田佳汰, 出倉沙也加, 菊川寛史, 満倉浩一, 吉田豊和

岐阜大院 自然科学技術

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Engineering of a transaminase for enzymatic triggered Aza-Michael cyclisations on bulky substrates

○Christopher Peel and Elaine O'Reilly

School of Chemistry, University of Nottingham, United Kingdom

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Enantioselective amine synthesis with an immobilized EsLeuDH mutant

○Aaron A. Ingram, Jana Löwe, Harald Gröger,

Chair of Organic Chemistry I, Faculty of Chemistry, Bielefeld University, Germany

P-40

Cyanide-free access to nitriles via aldoxime dehydratases: Enzyme optimization and stereoselective synthesis

○Keiko Oike¹, Tobias Betke¹, Philipp Rommelmann¹, Aaron A. Ingram¹, Yasuhisa Asano², Joe M. Risse³, Karl Friehs³ and Harald Gröger¹

¹Chair of Organic Chemistry I, Faculty of Chemistry, Bielefeld University ²Chair of Enzyme Chemistry, Faculty of Engineering, Toyama Prefectural University and Biotechnology Research Center ³Chair of Fermentation Engineering, Faculty of Technology, Bielefeld University, Germany

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Chemical reaction and enzyme reaction by microwave heated soxhlet extractor

○Mohammad Asif Mirdad¹, T. Ishihara², S. Fukuda², S. Ohuchi²

¹Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology,

²Department of Bioscience and Bioinformatics, Kyushu Institute of Technology

マイクロ波加熱ソックスレー抽出器による化学反応と酵素反応

○モハメド アシフ ミルダッド¹, 石原匠², 福田峻也², 大内将吉²

¹九工大院 生命体工, ²九工大 生命情報工

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Microwave irradiation technology for improving microbial substance production

○K. Haraguchi¹, T. Ninomiya², M. Kodama³, S. Ohuchi²

¹Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology,

²Department of Bioscience and Bioinformatics, Kyushu Institute of Technology, ³Vessel Inc.

微生物の物質生産向上を目的としたマイクロ波照射技術

○原口賢士¹, 二宮智宏², 児玉亮³, 大内将吉²

¹九工大院 生命体工, ²九工大 生命情報工, ³(株)ベセル

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Microbial cultivation by microwave irradiation device with precise controlled temperature

○M. Hirano¹, T. Hirasaka¹, A. Watanabe¹, M. Kodama², S. Ohuchi¹

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精密に温度制御されたマイクロ波照射装置による微生物培養

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Sterilization by microwave assisted chemistry

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マイクロ波促進化学による殺菌

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Study on cell-penetrating coenzymes NAD and FAD: How to modify the function of diphosphate on coenzyme

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Selective chemical protein modification via Nickel(II)-catalyzed arylation with arylboronic acid

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