

Curriculum Vitae: Katy C. Kao

Associate Professor
Department of Chemical and Materials Engineering
San Jose State University
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EDUCATION:

B.S. – Department of Chemical Engineering, University of California, Irvine (1997).

Ph.D. – Department of Chemical and Biomolecular Engineering, University of California, Los Angeles (2005).

Postdoctoral Fellow - Department of Genetics, Stanford University (2005-2008).

PROFESSIONAL EXPERIENCES:

Associate Professor – Department of Chemical and Materials Engineering, San Jose State University (8/2019 – present)

Associate Director of Undergraduate Program – Department of Chemical Engineering, Texas A&M University (8/2018 – 8/2019)

Visiting Researcher – Center for Systems and Synthetic Biology, University of Texas, Austin (8/2016 – 1/2017; Faculty Development Leave)

Associate Professor – Department of Chemical Engineering, Texas A&M University (9/2014 – 8/2019)

Assistant Professor – Department of Chemical Engineering, Texas A&M University (8/2008 – 8/2014)

Chemical Analysis Engineer – Western Digital Corporation, Lake Forest, CA (1997-1999)

AWARDS:

Presidential Undergraduate Research Award - 1996

National Institutes of Health - National Research Service Award (NRSA) - 2007

National Science Foundation - Faculty Early Career Development (CAREER) Award - 2011

TEES Select Young Faculty - 2012

Fluor Distinguished Teaching Award – 2013

George Armistead, Jr. '23 Faculty Excellence in Teaching Award – 2017

Association of Former Students Distinguished Achievement - College-Level Teaching Award – 2017-2018

Chemical Engineering Graduate Student Association (ChEGSA) Faculty of the year – 2018

PUBLICATIONS: (peer-reviewed; * indicates corresponding author; # indicates undergraduate student author)

Mian Huang, Jibrán Khan, Manpreet Kaur, Julian Daniel Torres Vanega[#], Orlando Andres Aguilar Patiño[#], Anand K. Ramasubramanian, Katy C. Kao*. *CgSTE11* mediates cross tolerance to multiple environmental stressors in *Candida glabrata*. *Scientific Reports*. 2019. 9, 17036. doi:10.1038/s41598-019-53593-5.

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Avinash Godara, Maria Alejandra Gomez Rodriguez[#], Joshua D. Weatherston, George L. Peabody V, Hung-Jen Wu, Katy C. Kao*. Beneficial mutations for carotenoids production identified from laboratory-evolved *Saccharomyces cerevisiae*. *J Industrial Microbiol Biotechnol*. 2019 Oct 8. doi: 10.1007/s10295-019-02241-y.

Guo Y, Xie S, Yuan JS, Kao KC*. Improved Carotenoids Production with Seawater by Engineered *Saccharomyces cerevisiae*. *Fermentation*. 2019.

Liu, Zhi-Hua; Hao, Naijia; Shinde, Somnath; Olson, Michelle; Bhagia, Samarthya ; Dunlap, John; Kao, Katy; Kang, Xiaofeng; Ragauskas, Arthur; Yuan*, Joshua. Co-design of Combinatorial Organosolv Pretreatment (COP) and Lignin Nanoparticles (LNPs) in Biorefineries. *ACS Sustainable Chemistry and Engineering*. 2019, 7, 2, 2634-2647.

Huang M, Kao KC*. Identifying novel genetic determinants for oxidative stress tolerance in *Candida glabrata* via adaptive laboratory evolution. *Yeast*. August 2018.

Olson ML, Jayaraman A*, Kao KC*. Relative abundance of *Candida albicans* and *Candida glabrata* in in vitro co-culture biofilms impacts biofilm structure and formation. *Appl Environ Microbiol*. April, 2018.

Peabody GL V, Li H, Kao KC*. Sexual recombination and increased mutation rate expedite evolution of *Escherichia coli* in varied fitness landscapes. *Nature Communications*. 2017;8(1):1255. doi:10.1038/s41467-017-02323-4.

Liu Z-H, Olson ML, Shinde S, et al. Synergistic maximization of the carbohydrate output and lignin processability by combinatorial pretreatment. *Green Chem*. 2017;19(20):4939-4955. doi:10.1039/C7GC02057K.

Guo Y, Winkler J, Kao KC*. Insights on Osmotic Tolerance Mechanisms in *Escherichia coli* Gained from an *rpoC* Mutation. *Bioengineering*. 2017;4(3):61–19. doi:10.3390/bioengineering4030061.

Peabody G, Winkler J, Fountain W[#], Castro DA[#], Leiva-Aravena E[#], Kao KC*. Experimental demonstration of the benefit of a recombination-proficient *Escherichia coli* system for Adaptive Laboratory Evolution. *Appl Environ Microbiol*. 2016;82(22):AEM.01850–16–6747. doi:10.1128/AEM.01850-16.

M. Carolina Ordonez, Jonathan P. Raftery, Tejasvi Jaladi, Xinhe Chen[#], Katy Kao, M. Nazmul Karim*. Modelling of batch kinetics of aerobic carotenoid production using *Saccharomyces cerevisiae*. *Biochemical Eng Journal*. 2016. 226–236.

Huang M, Peabody G, Kao KC*. Tolerance of Microbial Biocatalysts to Feedstocks, Products, and Environmental Conditions. In: *Metabolic Engineering for Bioprocess Commercialization*. Cham: Springer; 2016:73-100. doi:10.1007/978-3-319-41966-4_5.

Olson ML, Johnson J[#], Carswell WF, Reyes LH, Senger RS, Kao KC*. Characterization of an evolved carotenoids hyper-producer of *Saccharomyces cerevisiae* through bioreactor parameter optimization and Raman spectroscopy. *J Ind Microbiol Biotechnol*. July 2016. doi:10.1007/s10295-016-1808-9.

Peabody G, Kao KC*. "Recent progress in bio-butanol tolerance in microbial systems with an emphasis on *Clostridium*." *FEMS Microbiology Letters*. 2016.

Cheng C, Almario MP, Kao KC*. "Generation of recombinant yeasts for tolerance to inhibitors present in lignocellulosic hydrolysates." *Biotechnology Letters*. 2015.

Shangxian Xie, Xing Qin, Yanbing Cheng, Dhrubojyoti Laskar, Weichuan Qiao, Su Sun, Luis H. Reyes, Xin Wang, Susie Y. Dai, Scott E. Sattler, Katy Kao, Bin Yang, Xiaoyu Zhang, and Joshua S. Yuan*. "Simultaneous Conversion of All Cell Wall Components by Oleaginous Fungus without Chemo-physical Pretreatment." *Green Chemistry*. 2015. doi:10.1039/C4GC01529K

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Cheng C, & Kao* KC. "How to survive being hot and inebriated." *Science* 346, 35–36 (2014).

Winkler, JD & Kao* KC. "Recent Advances in the Evolutionary Engineering of Industrial Biocatalysts." *Genomics*. (2014). doi:10.1016/j.ygeno.2014.09.006

Peabody GL V, Winkler J & Kao* KC. "Tools for developing tolerance to toxic chemicals in microbial systems and perspectives on moving the field forward and into the industrial setting." *Current Opinion in Chemical Engineering* 6, 9–17 (2014).

Winkler J, Garcia C[#], Olson M, Callaway E[#], Kao KC*. "Evolved *Escherichia coli* osmotolerant mutants frequently exhibit defective n-acetylglucosamine catabolism and point mutations in the cell-shape regulating protein MreB." *Applied and Environmental Microbiology*. 2014. Doi: 10.1128/AEM.00499-14.

Reyes LH, Gomez JM[#], Kao KC*. "Improving carotenoids production in yeast via adaptive laboratory evolution." *Metabolic Engineering*. 2014. Jan:21: 26-33.

Highlighted in *Evolutionary Applications* March 2014. Volume 7, Issue 3: 337-338.

Reyes LH, Abdelaal AS, Kao KC*. "Genetic Determinants For N-Butanol Tolerance In Evolved *E. coli* Mutants. Cross Adaptation And Antagonistic Pleiotropy Between N-Butanol And Other Stressors." *Applied and Environmental Microbiology*. 2013. Sept;79(17):5313-20.

Almario MP, Reyes LH, Kao KC*. "Evolutionary engineering of *Saccharomyces cerevisiae* for enhanced tolerance to hydrolysates of lignocellulosic biomass." *Biotechnology and Bioengineering*. 2013. doi: 10.1002/bit.24938.

Winkler J, Kao KC*. "Harnessing Recombination to Speed Adaptive Evolution in *Escherichia coli*." *Metabolic Engineering*. 2012. Sep;14(5):487-95.

Reyes LH, Almario MP[#], Winkler J, Orozco MM[#], Kao, KC*. "Visualizing evolution in real time to determine the molecular mechanisms of n-butanol tolerance in *Escherichia coli*." *Metabolic Engineering*. *Metabolic Engineering*. 2012. Sep;14(5):487-95.

Reyes LH, Winkler J, Kao KC*. "Visualizing evolution in real-time method for strain engineering." *Frontiers in Microbiotechnology, Ecotoxicology and Bioremediation*. 2012. 3:198.

Huang M, Kao KC*. "Population dynamics and the evolution of antifungal drug resistance in *Candida albicans*." *FEMS Microbiology Letters*. 2012. Aug;333(2):85-93.

Winkler J, Kao, KC*. "Computational identification of adaptive mutants using the VERT system." *Journal of Biological Engineering*. 2012. 6, 3.

Huang M, McClellan M, Berman J, Kao KC*. "Evolutionary dynamics of *Candida albicans* during in vitro evolution." *Eukaryotic Cell*. 2011. Sept 2. PMID: 21890821.

Winkler J, Kao KC*. "Transcriptional analysis of *Lactobacillus brevis* to n-butanol and ferulic acid responses." *PLoS ONE*. 2011. 6(8), e21438.

Reyes LH, Almario MP[#], Kao KC*. "Genomic Library Screens for Genes Involved in n-Butanol Tolerance in *Escherichia coli*." *PLoS ONE*. 2011: March 8;6(3):e17678.

Kao KC, Sherlock G. "A Genome-Wide Analysis Reveals No Nuclear Dobzhansky-Muller Pairs of Speciation Genes Between *S. cerevisiae* and *S. paradoxus*, but Suggests More Complex Incompatibilities." *PLoS Genetics*. 2010: Jul 29;6(7):e1001038.

Winkler J, Rehmann M[#], Kao KC*, "Novel *Escherichia coli* hybrids with enhanced butanol tolerance." *Biotech. Letters*. 2010: 32(7): 915-20.

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Kao, KC, Sherlock, G. "Molecular Characterization of Clonal Interference during Adaptive Evolution in Asexual Populations of *Saccharomyces cerevisiae*." Nature Genetics. 2008 Dec 40 (12): 1499-504.

Kao, K.C, Tran, L.M., Liao, J.C. "A global regulatory role of gluconeogenic genes in *Escherichia coli* revealed by transcriptome network analysis." *J. Biol. Chem.* 2005 Oct; 280(43): 36079-36087.

Tran LM, Brynildsen MP, Kao KC, Suen JK, Liao JC. "gNCA: A framework for determining transcription factor activity based on transcriptome: identifiability and numerical implementation." *Metabolic Engineering*. 2005 Mar;7(2):128-41.

Kao KC, Yang YL, Boscolo R, Sabatti C, Roychowdhury V, Liao JC. "Transcriptome-based determination of multiple transcription regulator activities in *Escherichia coli* by using network component analysis." Proc Natl Acad Sci U S A. 2004 Jan 13;101(2):641-6.

Hyduke DR, Rohlin L, Kao KC, Liao JC. "A software package for cDNA microarray data normalization and assessing confidence intervals." *OMICS*. 2003 Fall;7(3):227-34.

Oh MK, Rohlin L, Kao KC, Liao JC. "Global expression profiling of acetate-grown *Escherichia coli*." *J Biol Chem*. 2002 Apr 12;277(15):13175-83.

BOOK CHAPTERS:

Reyes LH, Kao KC. Growth-Coupled Carotenoids Production Using Adaptive Laboratory Evolution. *Methods in Molecular Biology*. Michael Jensen and Jay Keasling. Springer. 2017.

Huang M, Peabody G, Kao KC. Tolerance of Microbial Biocatalysts to Feedstocks, Products, and Environmental Conditions. In: *Metabolic Engineering for Bioprocess Commercialization* (Stephen Van Dien, Editor). Cham: Springer; 2016:73-100.

Winkler, J, Reyes, LH, Kao, KC. 2013. Adaptive laboratory evolution for strain engineering. *Systems Metabolic Engineering: Methods and Protocols, Methods in Molecular Biology* (Hal Alper, Editor). Vol. 985. Springer.

Kao, KC, Tran, LM, and Liao, JC. 2009. Transcriptome Analysis of Regulatory Networks. Jayaraman, A and Hahn, J (Ed). *Methods in Bioengineering: Systems Analysis of Biological Networks*. Artec House.

EDITORIAL MEMBERSHIP:

Academic Editor - PLoS ONE (May 2010 – present)

Editorial board of *Journal of Biological Engineering* (January 2013 - present)

Guest Editor for Special Issue – *Journal of Industrial Microbiology and Biotechnology* (August 2018 – July 2019)

Guest Editor for Special Issue – *Journal of Industrial Microbiology and Biotechnology* (August 2019 – July 2020)

Editor of *Scientific Report* (August 2019 – present)

INVITED TALKS: (in reverse chronological order)

Godara A, Kao KC. "Using environmental stress as a driving force to improve biocatalyst productivity." Invited talk at AIChE Annual meeting. November 13, 2019.

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Kao KC. "Recombineering for adaptive laboratory evolution and for combining complex phenotypes." Novonordisk Center for Biosustainability, DTU. March 7, 2019.

Godara A, Weatherston J, Wu HJ, Kao KC. "Identification of new genetic determinants for increased carotenoids production in yeast using an adaptive laboratory evolution approach." Society of Industrial Microbiology and Biotechnology annual meeting, Chicago, IL. August 16, 2018: Non-GMO base strain and fermentation process development (invited speaker).

Kao KC. "Harnessing the adaptive capacity of biological systems for microbial strain development." University of Delaware. March 31, 2017.

Kao KC. "Recombination proficient *Escherichia coli* for adaptive laboratory evolution." EMBO Conference on Experimental Approaches to Evolution and Ecology Using Yeast and Other Model Systems. October 22, 2016.

Kao KC. "Evolutionary engineering for developing microbial cell factories." Indo-US Workshop on Cell Factories. IIT Mumbai. March 18-20, 2016.

Kao KC. "Adaptive laboratory evolution of fungal systems for improved production and robustness." Clemson University. December 3, 2015.

Kao KC. "Evolutionary engineering strategies for microbial strain development." DTU Novo Nordisk Foundation Center for Biosustainability, Denmark. September 29, 2015.

Kao KC. "Evolutionary engineering strategies for strain development." Virginia Tech, Blacksburg, VA. September 21, 2015.

Kao KC. "Engineering of yeast for carotenoids production." Universidad de Los Andes, Bogota, Colombia. April 14, 2015.

Kao KC. "Adaptive evolution as a tool to study complex phenotypes in microbial systems." University of Houston, Houston, TX. March 13, 2015.

Kao KC. "Development and characterization of a bacterial recombination system." University of Pennsylvania, Philadelphia, PA. March 5, 2015.

Kao KC. "Development of evolutionary engineering strategies for strain development." National Renewable Energy Laboratory, Golden, CO. August 25, 2014.

Kao KC. "Use of evolutionary engineering for strain development and scale-up studies for carotenoids production in yeast." Society of Industrial Microbiology and Biotechnology annual meeting, St. Louis, MO. July 24, 2014: Fermentation (invitation only)

Kao KC. "Evolutionary engineering of yeast for carotenoids production." UCLA Workshop on Metabolomics and Metabolic Engineering, Los Angeles, CA. June 4-5, 2014.

Kao KC. "Evolutionary dynamics and use of adaptive laboratory evolution for inverse strain engineering." Horizons in Biotechnology Seminar series, DuPont, Wilmington, DE. May 16, 2014.

Almario P, Reyes LH, Kao KC. "Evolutionary engineering for hydrolysates tolerance in yeast." Society of Industrial Microbiology and Biotechnology, San Diego, CA. August, 2013: Fermentation (invitation only).

Kao, KC. "Deciphering complex phenotypes in microbial systems." Departmental seminar, Chemical Engineering Program, School for Engineering of Matter, Transport, and Energy, Arizona State University, Tempe, AZ. November 5, 2012.

Reyes, LH, Kao, KC. "Mapping the adaptive landscape using a combination of a novel adaptive evolution method and genomic tools," Society of Industrial Microbiology annual meeting, Washington DC, August 2012: Fermentation (invitation only).

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Winkler, J, Kao, KC. "Development of a sexual recombination system to speed up evolutionary engineering in *Escherichia coli*," Society of Industrial Microbiology annual meeting, Washington DC, August 2012: Metabolic Engineering (invitation only).

Kao, KC. "Laboratory evolution and the adaptive landscape," Departmental Seminar, Department of Chemical Engineering, University of Houston, Houston, TX. June 19, 2012.

Reyes, LH, Kao, KC. "Application of the visualizing evolution in real-time (VERT) method to overcome biocatalyst inhibition." Society of Industrial Microbiology Annual Meeting, New Orleans, LA. July 2011: Metabolic Engineering (invitation only).

Kao, KC. "Deciphering the mechanisms of complex phenotypes in *Lactobacillus brevis* through transcriptome studies." Departmental Seminar, Department of Chemical Engineering, Korea University, South Korea. June 2010.

Kao, KC. "Adaptive evolution of *Escherichia coli* for biofuel tolerance." Departmental Seminar, Department of Chemical Engineering, Busan University, South Korea. June 2010.

Kao, K., Sherlock, G. "Molecular characterization of adaptive evolution in *Saccharomyces cerevisiae*", Microbiology and Molecular Genetics seminar series at the University of Texas Medical School at Houston, Houston, TX, November 6, 2008.

SOCIETY MEMBERSHIPS:

- Society of Industrial Microbiology and Biotechnology (SIMB)
- American Institute of Chemical Engineers (AIChE)
- American Society of Microbiology (ASM)
- American Chemical Society (ACS)