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EDUCATION:

Ph.D., Chemistry June 2001
California Institute of Technology, Pasadena, CA
Thesis Title: *Synthetic and Mechanistic Investigations of Ruthenium Olefin Metathesis Catalysts*

B.S.; M.S. *cum laude* with Distinction in Chemistry June 1996
Yale University, New Haven, CT

CURRENT POSITION:

University of Michigan, Ann Arbor, MI May 2007 – present
Associate Professor of Chemistry

PREVIOUS POSITIONS:

University of Michigan, Ann Arbor, MI
William R. Roush Assistant Professor of Chemistry October 2006 – May 2007
Assistant Professor of Chemistry July 2003 – October 2006

Princeton University, Princeton, NJ
NIH NRSA Postdoctoral Fellow August 2001 – June 2003
Advisor: Professor John T. Groves

California Institute of Technology, Pasadena, CA
Graduate Student August 1997 – July 2001
Advisor: Professor Robert H. Grubbs

Yale University, New Haven, CT
Undergraduate Student September 1994 – June 1996
Advisor: Professor Robert H. Crabtree

Naval Research Laboratory, Washington, DC
Summer Intern September 1994 – June 1996
Advisor: Dr. David W. Conrad

AWARDS and ADVISORY BOARDS:

JACS Editorial Advisory Board 2009-present
Synthesis and Synlett Editorial Advisory Board 2009-present
BASF Catalysis Award 2009
ACS Arthur C. Cope Scholar Award 2008
Dupont Young Investigator Award 2007
Roche Excellence in Chemistry Award 2007
GlaxoSmithKline Chemistry Scholars Award 2006
Abbott Young Investigator Award 2006
Presidential Early Career Award for Scientists and Engineers (PECASE) 2006
AstraZeneca Excellence in Chemistry Award 2006
Research Corporation Cottrell Scholar Award 2006
Alfred P. Sloan Research Fellow 2006

AWARDS (cont):

National Science Foundation CAREER Award	2006
Bristol Myers Squibb "Freedom to Discover" Award	2006
Eli Lilly Grantee Award	2005
Amgen Young Investigator Award	2005
Boehringer Ingelheim New Investigator Award in Organic Synthesis	2005
Beckman Young Investigator Award	2004-2007
Camille and Henry Dreyfus Foundation New Faculty Award	2003-2008
<i>Synlett</i> and <i>Synthesis</i> Editorial Board Assistant Professor Journal Awardee	2003
NIH NRSA Postdoctoral Fellowship	2001-2003
Herbert Newby McCoy Award for Graduate Research (Caltech)	2001
Laszlo Zechmeister Graduate Fellowship (Caltech)	1996-1998
Arthur Fleischer Award for Undergraduate Research (Yale)	1996
East Coast Athletic Conference Scholar-Athlete Award	1996
National Science Scholar	1993-1996
NCAA Gymnastics Academic All-American	1993-1996

RESEARCH PUBLICATIONS:

[*] represents independent publication

*(39) Hickman, A. J.; Villalobos, J. M.; Sanford, M. S. "A Quantitative Method to Assay Platinum Catalysts for Benzene H/D Exchange," *Organometallics* **2009**, in press.

*(38) Deprez, N. R.; Sanford, M. S. "Synthetic and Mechanistic Studies of Pd-Catalyzed C–H Arylation with Diaryliodonium Salts: Evidence for a Bimetallic High Oxidation State Pd Intermediate," *J. Am. Chem. Soc.* **2009**, asap article.

□ Highlighted in: *Chem. Eng. News* **2009**, 87 (28), 28-30.

*(37) Hull, K. L.; Sanford, M. S. "Mechanism of Benzoquinone-Promoted Palladium-Catalyzed Oxidative Cross Coupling Reactions," *J. Am. Chem. Soc.* **2009**, 131, 9651-9653.

*(36) Racowski, J. M.; Dick, A. R.; Sanford, M. S. "Detailed Study of C–O and C–C Bond-Forming Reductive Elimination from Stable C₂N₂O₂ Palladium(IV) Complexes," *J. Am. Chem. Soc.* **2009**, 131, asap article.

□ Featured on cover

*(35) Ball, N. D.; Sanford, M. S. "Synthesis and Reactivity of a Mono-σ-Aryl Palladium(IV) Fluoride Complex," *J. Am. Chem. Soc.* **2009**, 131, 3796-3797.

□ This work highlighted in: *Chem. Eng. News* **2008**, 86 (35), 53-56.

*(34) Lyons, T. W.; Sanford, M. S. "Pd(II/IV)-Catalyzed Cyclopropanation Reactions: Scope and Mechanism," *Tetrahedron* **2009**, 65, 3211-3221.

□ Invited contribution to *Symposium in Print honoring Professor Justin Du Bois*

*(33) Desai, L. V.; Stowers, K. J.; Sanford, M. S. "Insights into Directing Group Ability in Palladium-Catalyzed C–H Bond Functionalization," *J. Am. Chem. Soc.* **2008**, 130, 13285-13293.

*(32) Whitfield, S. R.; Sanford, M. S. "Reactions of Platinum(II) Complexes with Chloride-Based Oxidants: Routes to Pt(IV) and Pt(III) Products," *Organometallics* **2008**, 27, 1683-1689.

*(31) Kalyani, D.; Sanford, M. S. "Oxidatively Intercepting Heck Intermediates: Pd-Catalyzed 1,2- and 1,1-Arylhalogenation of Alkenes," *J. Am. Chem. Soc.* **2008**, 130, 2150-2151.

RESEARCH PUBLICATIONS (CONT):

- *(30) Whitfield, S. L.; Sanford, M. S. "Reactivity of Pd(II) Complexes with Electrophilic Chlorinating Reagents: Isolation of Pd(IV) Intermediates and Observation of C–Cl Bond-Forming Reductive Elimination," *J. Am. Chem. Soc.* **2007**, *129*, 15142-15143.
- *(29) Hull, K. L.; Sanford, M. S. "Catalytic and Highly Regioselective Cross-Coupling of Aromatic C–H Substrates," *J. Am. Chem. Soc.* **2007**, *129*, 11904-11905.
- *(28) Desai, L. V.; Sanford, M. S. "Construction of Tetrahydrofurans via Pd(II/IV)-Catalyzed Aminooxygenation of Alkenes," *Angew. Chem., Int. Ed.* **2007**, *46*, 5737-5740.
- *(27) Welbes, L. L.; Lyons, T. W.; Cychosz, K. A.; Sanford, M. S. "Synthesis of Cyclopropanes via Pd(II/IV)-Catalyzed Reactions of Enynes," *J. Am. Chem. Soc.* **2007**, *129*, 5836-5837.
- *(26) Dick, A. R.; Remy, M. S.; Kampf, J. W.; Sanford, M. S. "Carbon–Nitrogen Bond-Forming Reactions Between Palladacycles and Hypervalent Iodine Reagents," *Organometallics* **2007**, *26*, 1365-1370.
- *(25) Hull, K. L.; Lanni, E. L.; Sanford, M. S. "Highly Regioselective Catalytic Oxidative Coupling Reactions: Synthetic Scope and Mechanistic Insights," *J. Am. Chem. Soc.* **2006**, *128*, 14047-14049.
- *(24) Kalyani, D.; Dick, A. R.; Anani, W. Q.; Sanford, M. S. "Scope and Selectivity in Palladium-Catalyzed Directed C–H Bond Halogenation Reactions," *Tetrahedron* **2006**, *62*, 11483-11498.
□ *Invited contribution to Symposium in Print honoring Professor David MacMillan*
- *(23) Kalyani, D.; Dick, A. R.; Anani, W. Q.; Sanford, M. S. "A Simple Catalytic Method for the Regioselective Halogenation of Arenes," *Org. Lett.* **2006**, *8*, 2523-2526.
- *(22) Hull, K. L.; Anani, W. Q.; Sanford, M. S. "Palladium-Catalyzed Fluorination of Carbon–Hydrogen Bonds," *J. Am. Chem. Soc.* **2006**, *128*, 7134-7135.
- *(21) Deprez, N. R.; Kalyani, D.; Krause, A.; Sanford, M. S. "Room Temperature Palladium-Catalyzed 2-Arylation of Indoles," *J. Am. Chem. Soc.* **2006**, *128*, 4972-4973.
- *(20) Desai, L. V.; Malik, H. A.; Sanford, M. S. "Oxone as an Inexpensive, Safe, and Environmentally Benign Oxidant for C–H Bond Oxygenation," *Org. Lett.* **2006**, *8*, 1141-1145.
- (19) Han, Y. Z.; Sanford, M. S.; England, M. D.; Groves, J. T. "Mechanistic Studies of an Unusual Epoxide-Forming Elimination of a β -Hydroxyalkyl Rhodium Porphyrin," *Chem. Commun.* **2006**, 549-551.
- *(18) Kalberer, E. W.; Whitfield, S. R.; Sanford, M. S. "Application of Recyclable, Polymer-Immobilized Iodine(III) Oxidants in Catalytic C–H Bond Functionalization," *J. Mol. Catal. A* **2006**, *251*, 108-113.
□ *Invited contribution for special issue on oxidation catalysis*
- *(17) Dick, A. R.; Kampf, J. W.; Sanford, M. S. "Unusually Stable Pd(IV) Complexes: Detailed Mechanistic Investigation of C–O Bond-Forming Reductive Elimination," *J. Am. Chem. Soc.* **2005**, *127*, 12790-12791.
- *(16) Kalyani, D.; Sanford, M. S. "Regioselectivity in Palladium-Catalyzed C–H Activation/Oxygenation Reactions," *Org. Lett.* **2005**, *7*, 4149-4152.
- *(15) Kalyani, D.; Deprez, N. R.; Desai, L. V.; Sanford, M. S. "Oxidative C–H Activation/C–C Bond Forming Reactions: Synthetic Scope and Mechanistic Insights," *J. Am. Chem. Soc.* **2005**, *127*, 7330-7331.
- *(14) Dick, A. R.; Kampf, J. W.; Sanford, M. S. "Platinum Model Studies for Palladium-Catalyzed Oxidative Functionalization of C–H Bonds," *Organometallics* **2005**, *24*, 482-485.

RESEARCH PUBLICATIONS (CONT):

- *(13) Desai, L. V.; Hull, K. L.; Sanford, M. S. "Palladium-Catalyzed Oxygenation of Unactivated sp^3 C–H Bonds," *J. Am. Chem. Soc.* **2004**, *126*, 9542-9543.
□ Highlighted in: *Chem. Eng. News* **2004**, *82* (31), 35.
□ Highlighted in: *Lett. Org. Chem.* **2005**, *2* (5), 207.
- *(12) Dick, A. R.; Hull, K. L.; Sanford, M. S. "A Highly Selective Catalytic Method for the Oxidative Functionalization of C–H Bonds," *J. Am. Chem. Soc.* **2004**, *126*, 2300-2301.
- (11) Sanford, M. S.; Groves, J. T. "Anti-Markovnikov Hydrofunctionalization of Olefins Mediated by Rhodium Porphyrins," *Angew. Chem., Int. Ed.* **2004**, *43*, 588-590.
□ Highlighted in: *Chem. Eng. News* **2004**, *82* (11), 42-43.
- (10) Love, J. A.; Sanford, M. S.; Henling, L. M.; Day, M. W.; Grubbs, R. H. "Synthesis, Structure, and Activity of Enhanced Initiators for Olefin Metathesis" *J. Am. Chem. Soc.* **2003**, *125*, 10103-10109.
- (9) Trnka, T. M.; Morgan, J. P.; Sanford, M. S.; Wilhelm, T. E.; Scholl, M.; Choi, T.-L.; Ding, S.; Day, M. W.; Grubbs, R. H. "Synthesis and Reactivity of Ruthenium Alkylidene Complexes Coordinated with Phosphine and N-Heterocyclic Carbene Ligands" *J. Am. Chem. Soc.* **2003**, *125*, 2546-2558.
- (8) Sanford, M. S.; Valdez, M. L.; Grubbs, R. H. "Reaction of $TpRu(\eta^2-O_2CCHPh_2)PPh_3$ with Carbene and Vinylidene Precursors," *Organometallics* **2001**, *20*, 5455-5463.
- (7) Sanford, M. S.; Love, J. A.; Grubbs, R. H. "A Versatile Precursor for the Synthesis of Ruthenium Olefin Metathesis Catalysts," *Organometallics* **2001**, *20*, 5314-5318.
- (6) Sanford, M. S.; Love, J. A.; Grubbs, R. H. "Mechanism and Activity of Ruthenium Olefin Metathesis Catalysts," *J. Am. Chem. Soc.* **2001**, *123*, 6543-6554.
- (5) Sanford, M. S.; Ulman, M.; Grubbs, R. H. "New Insights into the Mechanism of Ruthenium Catalyzed Olefin Metathesis Reactions," *J. Am. Chem. Soc.* **2001**, *123*, 749-750.
- (4) Sanford, M. S.; Henling, L. M.; Day, M. W.; Grubbs, R. H. "Ruthenium-Based Four-Coordinate Olefin Metathesis Catalysts," *Angew. Chem., Int. Ed.* **2000**, *39*, 3451-3454.
- (3) Sanford, M. S.; Henling, L. M.; Grubbs, R. H. "Synthesis and Reactivity of Neutral and Cationic Ruthenium(II) Tris(pyrazolyl)borate Alkylidenes," *Organometallics* **1998**, *17*, 5384-5389.
- (2) Sanford, M. S.; Charles, P. T.; Commisso, S. M.; Roberts, J. C.; Conrad, D. W. "Photoactivatable Cross-Linked Polyacrylamide for the Site-Selective Immobilization of Antigens and Antibodies," *Chem. Mater.* **1998**, *10*, 1510-1520.
- (1) Burdeniuc, J.; Sanford, M.; Crabtree, R. H. "Amine Charge Transfer Complexes of Perfluoroalkanes and an Application to Poly(tetrafluoroethylene) Surface Functionalization," *J. Fluor. Chem.* **1998**, *91*, 49-54.

REVIEWS AND BOOK CHAPTERS:

*(7) Lyons, T. L.; Sanford, M. S. "Palladium-Catalyzed Ligand-Directed C–H Functionalization Reactions," *Chem. Rev.* **2009**, manuscript accepted.

□ *Invited review for special issue on C–H Functionalization*

*(6) Kalyani, D.; Sanford, M. S. "Chelate-Directed Oxidative Functionalization of Carbon–Hydrogen Bonds: Synthetic Applications and Mechanistic Insights," In *Topics in Organometallic Chemistry, Vol. 24*, Naoto Chatani, Ed., Springer, **2007**, 85-116.

□ *Invited book chapter*

*(5) Deprez, N. R.; Sanford, M. S. "Reactions of Hypervalent Iodine Reagents with Palladium: Mechanisms and Applications in Organic Synthesis," *Inorg. Chem.* **2007**, *46*, 1924-1935.

□ *Invited review for Forum on Palladium Chemistry in Organic Synthesis*

*(4) Dick, A. R.; Sanford, M. S. "Transition Metal Catalyzed Oxidative Functionalization of C–H Bonds," *Tetrahedron* **2006**, *62*, 2439-2463.

□ *Invited Review, Featured on Cover*

(3) Sanford, M. S.; Love, J. A. "Mechanism of Ruthenium-Catalyzed Olefin Metathesis Reactions," In *Handbook of Metathesis – Volume 1: Catalyst Development*, Grubbs, R. H., Ed., Wiley-VCH, **2003**, p. 112-131.

(2) Grubbs, R. H.; Trnka, T. M.; Sanford, M. S. "Transition Metal Carbene Complexes in Olefin Metathesis and Related Reactions," *Curr. Meth. Inorg. Chem.* **2002**, *3*, 187-231.

(1) Grubbs, R. H.; Sanford, M. S. "Mechanism of Ruthenium Based Olefin Metathesis Catalysts," In *Ring Opening Metathesis Polymerization and Related Chemistry*, E. Khosravi and T. Szymanska-Buzar, Eds., Kluwer Academic Publishers, **2002**, p. 17-21.