Tijana Rajh

The School of Molecular Sciences• Arizona State University

Education

Postdoctoral Appointment, 1986-1987 Chemistry Department, Hebrew University of Jerusalem, Israel

Ph.D. Physical Chemistry, 1986, University of Belgrade, Yugoslavia/ Part of research NREL, Golden, Colorado

M.S. Physical Chemistry, 1984, University of Belgrade, Yugoslavia

B.A. Physical Chemistry, 1982, University of Belgrade, Yugoslavia

Biography

Tijana Rajh began her tenure as the Director of the School of Molecular Sciences, SMS (former Department for Chemistry and Biochemistry) of Arizona State University in July 2021. She joined Arizona State University from the Argonne National Laboratory's Center for Nanoscale Materials (CNM), one of five DOE Centers designed to advance scientific and technical knowledge in different areas of nanoscale science. At the SMS, she is responsible for implementing new directions that will increase impact in both research and education of SMS. For this purpose, she hired outstanding new faculty and facilitated a significant increase in the Department's endowment, with several students and endowed fellowships. She is also responsible for enabling new, improved educational facilities and alumni engagement. At Argonne, she was a driving force in conceiving, planning, and managing the cross-cutting science and collaborative interdisciplinary research that resulted in several successful programs supported by the US DOE Office of Science, Basic Energy Sciences, partnerships with other research groups at Argonne and with industry (HP, Agilent, Nanophase, SCCD Inc).

As the Director of SMS and Deputy Division Director of CNM, she was responsible for identifying and implementing the scientific agenda. In this role, she worked on the vision for scientific growth, correlated scientific vision, and identified key scientific directions of growth. For her management responsibilities, she was trained in the Executive leadership program developed by the University of Chicago, Booth School of Business. She also attended the Leading and Implementing the Change and Innovation program at the University of Chicago Booth School of Business in November 2013. She also participated in the hiring of ten new faculty in her two years at the ASU, lead management positions at Argonne (associated Laboratory Directors, Division Directors, and Diversity Specialists, just to name a few), and scientists at the CNM. As a Group Leader in the conceptual phase of the CNM, she set the vision, direction, and structure of NanoBio Interfaces Group and its role in the CNM. To realize her vision, she assembled a diverse multidisciplinary team to investigate complex nanobio-related systems.

Tijana is involved in leading change in diversity and inclusion in scientific institutions. She served on the Women in Science and Technology (WIST) Steering Committee (2000-2005 and 2010-2016) as well as the Diversity and Inclusion Council of Argonne (2012-2019). She was also part of the Diversity and Inclusion Council Mentoring Subgroup and led the Mentoring Program for postdocs and early career scientists (2006-2015).

Honors/Awards

- Argonne Distinguished Fellow 2017
- Outstanding Postdoctoral Mentor 2016
- University of Chicago Distinguished Performance Award 2015
- AAAS Fellow 2014
- UIC Bioengineering External Advisory Board 2013
- AWIS Innovation Award 2009

- DOE-BES Council for Chemical Sciences 2005-2009
- University of Chicago/Argonne Consortium for Nanoscience Research (CNR) 2002-1007
- ANL Pacesetter Award 2002

Professional Experience

- Director and Professor, The School of Molecular Sciences, Arizona State University 2021-present
- Argonne Distinguished Fellow, ANL 2017-2021
- Deputy Division Director, Nanoscience and Technology Division and Center for Nanoscale Materials, ANL 2015-2019
- Group Leader, interim, X-ray and Electron Microscopy Group, ANL 20016-2017
- Group Leader, NanoBio Interface Group, Center for Nanoscale Materials, ANL 2006-2016
- Strategic Leadership Program developed by the University of Chicago Booth School of Business. 2013
- Led and Implemented the Change and Innovation program at the University of Chicago Booth School of Business 2013
- Senior Scientist, Argonne National Laboratory 2012-present
- Group Leader, Radiation and Photochemistry, Chemistry Department, ANL 2002-2004
- Chemist, Photosynthesis Group, Chemistry Department, ANL 1996-2006
- Visiting Scientist, Chemistry Department ANL 1994-1996
- Chemist, "Boris Kidric" Institute, Vinca, Belgrade, Yugoslavia 1987-1994
- Postdoctoral Appointee, Hebrew University of Jerusalem, Israel 1985 -1986
- Visiting Scholar, National Renewable Energy Laboratory, Golden CO 1984-1985
- Research Assistant, "Boris Kidric" Institute, Vinca, Belgrade, Yugoslavia 1982-1986
- Undergraduate Research Participant, "Boris Kidric" Institute, Vinca, Belgrade, Yugoslavia 1981-1982

Professional Activities

- Member of the Search Committee for the Associated Laboratory Director for Physical Sciences 2017-2018
- BESAC DOE Subcommittee on Challenges at the Frontiers of Matter and Energy 2014-1015
- Organizer, Launchpad Lecture Series 2015
- Chair, Condensed Soft and Disordered Materials (CSD) Panel, Proposal Review Panel Linac Coherent Light Source (PRP LCLS) 2014-2018
- Member, Search Committee for the Nanoscience and Technology Division Director 2014

- Member, Condensed Soft and Disordered Materials (CSD) Panel, Proposal Review Panel Linac Coherent Light Source (PRP LCLS) 2013-2014
- Member of Diversity and Inclusion Advisory Council, ANL 2012-2019
- Steering Committee, Women in Science and Technology Program, ANL, Member 2010-2015
- Mentoring Coordinator Center for Nanoscale Materials 2010-2018
- Search Committee for the Associated Laboratory Director for the Physical Sciences and Engineering Directorate ANL. 2010
- Panel Member: Women in Science Symposium 2010: Building an Identity, Chicago Council on Science and Technology, Northwestern University, Chicago. 2010
- Discussion Leader: Gordon Conference: Photochemistry, Bryant University, Smithfield, RI 2009
- Panel member: New Frontiers in Characterizing Biological Systems, DOE-BES, Washington DC 2009
- Panel Member: Basic Energy Science Workshop on Solar Energy Utilization, DOE-BES 2005
- Organizer, Biological, and Chemical Nanoscale Materials Workshop, 2nd Users CNM Meeting, ANL 2005
- Organizer, IIT-Argonne Nanoscience Workshop, Chicago, IL 2004
- Invited Presenter: DOE National Nanotechnology Initiative Grand Challenge Workshop, Nanoscience Research for Energy Needs, DOE-BES, Arlington, VA 2004
- Organizer, NU-ANL Nanoscience Workshop, Northwestern University, Evanston, IL 2003
- Search Committee for Director of the Center for Nanoscale Materials, ANL, Member 2004
- Search Committee for Joint Appointments to University of Chicago/ANL Member 2002-2003
- Consortium for Nanoscience Research 2002-2007
- Review Panel Member: DOE Nanoscience Initiative 2002
- Steering Committee Member, Women in Science and Technology Program, Argonne National Laboratory, Argonne, IL 2000-2005
- Chair, "Free Radicals in Condensed Phase Solids and Interfaces" Session, 217th American Chemical Society Meeting, Anaheim, CA 1999
- Panel Member: "Solution Kinetics and Catalytic Processes" Panel, Research Needs and Opportunities in Radiation Chemistry Workshop, DOE-BES, Chesterton, Indiana 1998

Adjunct and Visiting Positions

- Adjunct Professor, University of Illinois at Chicago, Department of Bioengineering 2016-present
- Adjunct Professor, University of Illinois at Chicago, Department of Electrical and Computer Engineering 2005-2007

- Visiting Scientist, Chemistry Division, Argonne National Laboratory, Argonne, Illinois Research group of Marion Thurnauer 1994-1996
- Visiting Scholar, Clarkson University, Potsdam, NY, Research group of Egon Matijevic 1985
- Visiting Scholar, Solar Energy Research Institute, Golden, Colorado, USA, the research group of Arthur J. Nozik 1984-1985

Major Research Accomplishments

Tijana Rajh has extensive experience in synthesizing and studying colloidal semiconductor nanocrystals and their integration into hierarchical assemblies. She conducted some of the earliest research on quantum dots, a scientific area that has grown enormously and is of great interest and impact. Her early studies involved electron transfer reactions and photoelectrochemistry of colloidal semiconductors and quantum dots, solar energy conversion into chemical fuels, and surface modification of nanocrystalline TiO2 nanoparticles for light-induced chemistries. She developed methods for seamless electronic integration of chelating ligands and colloidal semiconductors, creating hybrid properties between nanoparticles and organic molecules. She applied magnetic resonance techniques to investigate spin effects during photoinduced electron transfer in the hybrid structures. She also proposed the first method to control and initiate chemical reactions between semiconductor nanoparticles and biomolecules such as DNA strands and antibodies. Her current work focuses on developing self-adapting nanostructures for energy transduction, conversion, and storage and hybrid systems for sensing biomolecules, including quantum qubits.

Size quantization in semiconductor nanoparticles (1983-1993): One of the first reports on quantization effects in small colloidal semiconductor particles (now called semiconductor quantum dots or nanocrystals) confirmed the concept of quantum confinement in three dimensions.

Understanding of the surface structure of nanoparticles (1996-1997): First observation of the under-coordinated environment of surface atoms in small TiO2 nanoparticles. For nanoparticles of different particle sizes (2-20 nm) the number of under-coordinated sites was correlated with the number of surface atoms and unique surface chemistry exhibited by nanoparticles.

Light-induced charge separation in surface "healed" nanoparticles (1999-2002): Discovery of undercoordinated sites in metal oxide nanoparticles was correlated with high affinity for binding to oxygen-rich bidentate ligands such as enediol molecules. Seamless integration of nanoparticles and enediol ligands enabled tuning of optical and electronic properties of metal oxide nanoparticles. These novel nanocrystallites operate as type II core-shell structures with a charge-transfer mechanism between metal oxide core and organic shell.

Photocatalysis of Metal Oxide nanoparticles (2003-present): Enhanced photocatalytic activity of mixed-phase TiO2 and how they outperform the individual polymorphs was explained by the electron transfer mechanism. While rutile polymorph was identified as an antenna that extends the photoactivity into visible wavelengths, anatase was identified as a sink for photogenerated electrons, fostering enhanced charge separation. This work identified mixed-phase semiconductors as optimized systems for enhanced chemical activity. Recently, we identified the active facets for CO_2 reduction on Cu_2O particles and exploited this to obtain high conversion efficiency and selectivity of carbon dioxide to methanol.

Biology of Nanoparticle Composites (2003-present): Electronically integrated TiO2 nanoparticles and DNA oligonucleotides were successfully introduced into the cell nucleus with sequence-specific subcellular localization. Nanocomposites possess chemically and biologically unique properties of a

light-inducible nucleic acid endonuclease, which could become a new tool for gene therapy. Similar approaches were applied to TiO2-antibody nanocomposites.

SERS using Semiconductor Nanoparticles (2009-2013): The first report of SERS supported by dielectric (metal oxide TiO2, Fe2O3, ZrO2, and CeO2) nanoparticles. The enhancement factor for a single nanoparticle in solution was determined to be up to ~10^3 and suggested the chemical mechanism of SERS enhancement. Enhanced Raman scattering was also observed for the bioconjugated systems. Opportunity for developing Raman-based in vivo and in vitro bio detection, as well as cell labeling and imaging combined with nanotherapeutic strategies, is presented.

Nanoarchitectured Rechargeable Batteries (2011-2016): Demonstration of novel self-adaptive nanostructures in rechargeable batteries. Traditionally, battery electrodes are made from crystalline materials whose performance is fading upon prolonged cycling. The work demonstrated that amorphous materials can develop the structure best suited for obtaining high capacity, power, and long-term stability. The approach was found applicable to different types of transporting ions (Li^+, Na^+, or Mg^{2+}).

Publications

Refereed Journal Articles (h index 68, total number of papers 224, total number of citations 19880, Google Scholar)

1. **Light and Chemical Doping Induced Magnetic Behavior of Eu Molecular Systems**
   T. Rajh, E. Masson, K. Z. Latt, A. Smith, A. M. Brugh, N. Dandu, D. Trainer, et al. *Inorganic Chemistry*, in press, doi.org/10.1021.acs.inorgchem.3c01154.
2. **Amplified Spontaneous Emission from Europium-based Molecular Complexes Coupled to Photonic Crystals Cavities**
   R. Emmanuele, W. Wang, A. Smith, X. Cheng, E. Masson, D. Gosztola, T. Rajh et al. *Applied Physics Letters*, in press, doi: 10.1063/5.0160179.
3. **Formation of carbon-induced nitrogen-centered radicals on titanium dioxide under illumination**
   P.W. Huang, N.Tian, T. Rajh, Y.H.Liu, G. Innocenti, C. Sievers, A. Medford, M. Hatzell, CehmRxv, DOI:10.26434/chemrxiv-2023-00c51 (2023)
4. **Realizing Solution-Phase Room Temperature Quantum Coherence in a Tetrathiafulvalene-Based Diradicaloid Complex**
   L. McNamara, A. Zhou, T. Rajh, L. Sun, J. Anderson, ChemRxv, DOI:10.26434/chemrxiv-2023-wvt59
5. **Long-lived Electronic Spin Qubits in Single-walled Carbon Nanotubes**
   J.-S. Chen, K. J. Trerayapiwat, L. Sun, M. D. Krzyaniak, M. R. Wasielewski, T. Rajh, et al., *Nature Communications* ,14 (1), 848 (202)
   Electronic Spin Qubit Candidates Arrayed within Layered Two-Dimensional Polymers
   A. K. Oanta, K. A. Collins, A. M. Evans, S. M. Pratik, L. A. Hall, M. J. Strauss, et al., *Journal of the American Chemical Society* ,145 (1), 689-696 (2023)
6. **Triggering Cell Death in Cancers Using Self-Illuminating Nanocomposites**
   T. Rajh, T. Koritarov, B. Blaiszik, S. Rizvi, V. Konda and M. Bissonnette, *Frontiers in Chemistry*, 10, 3389- (2022)

7. **Hyperfine Interactions and Coherent Spin Dynamics of Isotopically Purified $^{167}Er^{3+}$ in Polycrystalline Y_2O_3**
   T. Rajh, L. Sun, S. Gupta, J. Yang, H. Zhang and T. Zhong, *Materials for Quantum Technology*, 2 (4), 045002- (2022)
8. **Room-Temperature Quantitative Quantum Sensing of Lithium Ions with a Radical-Embedded Metal–Organic Framework**
   L. Sun, L. Yang, J.-H. Dou, J. Li, G. Skorupskii, M. Mardini, et al., *Journal of the American Chemical Society*, 144 (41), 19008-19016 (2022)
9. **Photonic Microresonator-based Sensor for Selective Nitrate Ion Detection**
   Z. Zhang, X. Zhang, T. Rajh and S. Guha, *Sensors and Actuators B: Chemical*, 328, 129027- (2021)
10. **Controlled n-Doping of Naphthalene Diimide-Based Two-Dimensional Polymers**
    AM Evans, KA Collins, S Xun, TG Allen, S Jhulki, I Castano, HL Smith, et al., *Advanced Materials*, 2101932 (2021)
11. **Visualizing Heterogeneity of Monodisperse CdSe Nanocrystals by Their Assembly into Three-Dimensional Supercrystals**
    EV Shevchenko, P Podsiadlo, X Wu, B Lee, T Rajh, R Morin, M Pelton, *ACS nano* 14 (11), 14989-14998 (2020)
12. **Ultrafast Imaging the Evanescent Electromagnetic Field of Nanostructures by UEM**
    H Liu, TE Gage, A Jaiswal, P Singh, RD Schaller, T Rajh, I Arslan, *Microscopy and Microanalysis* 26 (S2), 428-429 (2020)
13. **Photonic microresonator based sensor for selective nitrate ion detection,** Zhang, Z., Zhang, X., Rajh, T., Guha, S. *Sensors and Actuators B: Chemical* 328, 129027 (2021)
14. **Ultrafast formation of a transient two-dimensional diamondlike structure in twisted bilayer graphene** Luo, D., et al., *Phys. Rev. B* 102 (15), 155431 (2020)
15. **Visualizing Heterogeneity of Monodisperse CdSe Nanocrystals by Their Assembly into Three-Dimensional Supercrystals** Shevchenko, E; Podsiadlo, P; Wu, X; Lee, Byeongdu; Rajh, T; Morin, R; Pelton, M., *ACS Nano*, 14 (11), 14989-14998 (2020)
16. **Synthesis of Honeycomb-Structured Beryllium Oxide Via Graphene Liquid Cells** Wang, L.; Liu, L.; Chen, J.; Mohsin, A.; Yum, J. H.; Hudnall, T. W.; Bielawski, C. W.; Rajh, T.; Bai, X.; Gao, S.-P, *Angewandte Chemie - International Edition* (2020).
17. **Ultrafast Formation of Transient 2d Diamond-Like Structure in Twisted Bilayer Graphene.** Luo, D.; Hui, D.; Wen, B.; Li, R.; Yang, J.; Shen, X.; Reid, A. H.; Weathersby, S.; Kozina, M. E.; Park, S., arXiv preprint arXiv:2003.08341 (2020).
18. **Epitaxial Er-Doped Y_2O_3 on silicon for quantum coherent devices**, Singh M.K.; et al. *APL Materials* 8, 031111 (2020)
19. **Visualizing anisotropic oxygen diffusion in ceria at activated condition**. Zhu, L.; et al. *Phys. Rev. Lett.* 2020 124, 056002.
20. **Unusual Reduction of Graphene oxide by Titanium dioxide electrons Produced by Ionizing radiation**. **Reaction Products and Mechanism** Behar, D; Rajh, T.; Liu, Y; Connell, J; Stamenkovic, V; and Rabani, J., *J. Phys. Chem. C.*, 2020, 124, 9, 5425-5435.

21. **Facet-Dependent Active Sites of a Single Cu2o Particle Photocatalyst for Co2 Reduction to Methanol.** Wu, Y. A., et al., *Nature Energy* 2019, 4, 957-968.
22. **Light-Gated Synthetic Protocells for Plasmon-Enhanced Chemiosmotic Gradient Generation and ATP Synthesis.** Chen, Z. W.; Silveira, G. D.; Ma, X. D.; Xie, Y. S.; Wu, Y. M. A.; Barry, E.; Rajh, T.; Fry, H. C.; Laible, P. D.; Rozhkova, E. A., *Angewandte Chemie-International Edition* 2019, 58, 4896-4900.
23. **Energy Transfer Induced by Dye Encapsulation in a Hybrid Nanoparticle-Purple Membrane Reversible Assembly.** Silveira, G. D.; Chen, Z. W.; Barry, E. F.; Diroll, B. T.; Lee, B.; Rajh, T.; Rozhkova, E. A.; Laible, P. D.; Fry, H. C., *Advanced Functional Materials* 2019, 29.
24. **Atomistic Manipulation of Reversible Oxidation and Reduction in Ag with an Electron Beam**. Sheng, H. P.; Zheng, H.; Jia, S. F.; Chan, M. K. Y.; Rajh, T.; Wang, J. B.; Wen, J. G., *Nanoscale* 2019, 11, 10756-10762.
25. **Semi-Artificial Photosynthetic CO_2 Reduction through Purple Membrane Re-Engineering with Semiconductor**. Chen, Z. W., et al., *Journal of the American Chemical Society* 2019, 141, 11811-11815.
26. **Design of lithium cobalt oxide electrodes with high thermal conductivity and electrochemical performance using carbon nanotubes and diamond particles.** Lee, E.; Salgado, R. A.; Lee, B.; Sumant, A. V.; Rajh, T.; Johnson, C.; Balandin, A. A.; Shevchenko, E. V., *Carbon* 2018, 129, 702-710.
27. **Colloidal GaAs Nanocrystals**. V. Srivastava, W. Liu, E. M. Janke, V. Kamysbayev, A. S. Filatov, C.-J. Sun, B. Lee, T. Rajh, R. D. Schaller and D. V. Talapin, Nano Letters, (2017).
28. **Direct Evidence of Chelated Geometry of Catechol on TiO2 by a Combined Solid State NMR and DFT Study**. D. Finkelstein-Shapiro, S. K. Davidowski, P. Lee, C. Guo, G. P. Holland, T. Rajh, K. A. Gray, J. L. Yarger and M. Calatayud, The Journal of Physical Chemistry C, (2016).
29. **Nitrite Reduction to Nitrous Oxide and Ammonia by TiO2 Electrons in a Colloid Solution via Consecutive One-Electron Transfer Reactions**. S. Goldstein, D. Behar, T. Rajh and J. Rabani, J. Phys. Chem. A 120 (15), 2307-2312 (2016).
30. **Molecular deposition of a macrocyclic cobalt catalyst on TiO2 nanoparticles.** C. Liu, T. Jin, M. E. Louis, S. A. Pantovich, S. L. Skraba-Joiner, T. Rajh and G. H. Li, Journal of Molecular Catalysis a-Chemical 423, 293-299 (2016).
31. **Solar hydrogen generation over CdS incorporated in Ti-MCM-48 mesoporous materials under visible light illumination**. R. Peng, C. M. Wu, J. Baltrusaitis, N. M. Dimitrijevic, T. Rajh and R. T. Koodali, Int. J. Hydrogen Energy 41 (7), 4106-4119 (2016).
32. **Evolution of Self-Assembled ZnTe Magic-Sized Nanoclusters** Zhang J, *et al. Journal of the American Chemical Society* 137(2):742-749. (2015)
33. **Targeted Photodynamic Nanoconjugate Therapy for Colon Cancer**. T. Koritarov, V. Valuckaite, R. Mustafi, U. Dougherty, I. Waxman, M. Bissonnette, T. Rajh and V. J. Konda, Gastroenterology 148 (4), S15-S15 (2015).
34. **Nanostructured Layered Cathode for Rechargeable Mg-Ion Batteries**. S. Tepavcevic, Y. Z. Liu, D. H. Zhou, B. Lai, J. Maser, X. B. Zuo, H. Chan, P. Kral, C. S. Johnson, V. Stamenkovic, N. M. Markovic and T. Rajh, *ACS Nano* 9 (8), 8194-8205 (2015).

35. **Visualizing Redox Dynamics of a Single Ag/AgCl Heterogeneous Nanocatalyst at Atomic Resolution**. Y. M. A. Wu, L. Li, Z. Li, A. Kinaci, M. K. Y. Chan, Y. G. Sun, J. R. Guest, I. McNulty, T. Rajh and Y. Z. Liu, *ACS Nano* 10 (3), 3738-3746 (2016).
36. **Nitric Oxide Reduction to Ammonia by TiO2 Electrons in Colloid Solution via Consecutive One-Electron Transfer Steps** Goldstein S, Behar D, Rajh T, & Rabani J *Journal of Physical Chemistry A* 119(12):2760-2769. (2015)
37. **Photoinitiated charge separation in a hybrid titanium dioxide metalloporphyrin peptide material** (vol 5, 4606, 2014) Fry HC, Liu Y, Dimitrijevic NM, & Rajh T *Nature Communications* 6. (2015)
38. **Preparation of TiO2-SiO2 aperiodic mesoporous materials with controllable formation of tetrahedrally coordinated Ti^{4+} ions and their performance for photocatalytic hydrogen production** Wu C-M, Peng R, Dimitrijevic NM, Rajh T, & Koodali RT *International Journal of Hydrogen Energy* 39(1):127-136. (2014)
39. **Photoinduced Electron Transfer Pathways in Hydrogen-Evolving Reduced Graphene Oxide-Boosted Hybrid Nano-Bio Catalyst** Wang P, *et al. ACS Nano* 8(8):7995-8002. (2014)
40. **Insight into band positions and inter-particle electron transfer dynamics between CdS nanoclusters and spatially isolated TiO 2 dispersed in cubic MCM-48 mesoporous materials: a highly efficient system for photocatalytic hydrogen evolution under visible light illumination** Rui P, *et al. Physical Chemistry Chemical Physics* 16(5):2048-2061. (2014)
41. **Titanium Dioxide in the Service of the Biomedical Revolution** Rajh T, Dimitrijevic NM, Bissonnette M, Koritarov T, & Konda V *Chemical Reviews* 114(19):10177-10216. (2014)
42. **Insight into band positions and inter-particle electron transfer dynamics between CdS nanoclusters and spatially isolated TiO2 dispersed in cubic MCM-48 mesoporous materials: a highly efficient system for photocatalytic hydrogen evolution under visible light illumination** Peng R, *et al. Physical Chemistry Chemical Physics* 16(5):2048-2061. (2014)
43. **A bioinspired redox relay that mimics radical interactions of the Tyr-His pairs of photosystem II** Megiatto JD, Jr., *et al. Nature Chemistry* 6(5):423-428. (2014)
44. **Toward Lithium Ion Batteries with Enhanced Thermal Conductivity** Koo B, *et al. Acs Nano* 8(7):7202-7207. (2014)
45. **Photoinitated charge separation in a hybrid titanium dioxide metalloporphyrin peptide material** Fry HC, Liu Y, Dimitrijevic NM, & Rajh T *Nature Communications* 5. (2014)
46. **Preparation of TiO2-SiO2 aperiodic mesoporous materials with controllable formation of tetrahedrally coordinated Ti^{4+} ions and their performance for photocatalytic hydrogen production** Chia-Ming W, Rui P, Dimitrijevic NM, Rajh T, & Koodali RT *International Journal of Hydrogen Energy* 39(1):127-136. (2014)
47. **Enhanced autonomic shutdown of Li-ion batteries by polydopamine coated polyethylene microspheres** Baginska M, Blaiszik BJ, Rajh T, Sottos NR, & White SR *Journal of Power Sources* 269:735-739. (2014)
48. **Compositional Tuning of Structural Stability of Lithiated Cubic Titania via a Vacancy-Filling Mechanism under High Pressure** Xiong H, *et al. Physical Review Letters* 110(7). (2013)

49. **Probing the Nature of Bandgap States in Hydrogen-Treated TiO2 Nanowires** Wheeler DA, *et al. Journal of Physical Chemistry C* 117(50):26821-26830. (2013)
50. **Ultra-stable CdS incorporated Ti-MCM-48 mesoporous materials for efficient photocatalytic decomposition of water under visible light illumination** Peng R, *et al. Chemical Communications* 49(31):3221-3223. (2013)
51. **Synthesis-Dependent Oxidation State of Platinum on TiO2 and Their Influences on the Solar Simulated Photocatalytic Hydrogen Production from Water** Parayil SK, *et al. Journal of Physical Chemistry C* 117(33):16850-16862. (2013)
52. **In Situ Visualization of Self-Assembly of Charged Gold Nanoparticles** Liu Y, Lin X-M, Sun Y, & Rajh T *Journal of the American Chemical Society* 135(10):3764-3767. (2013)
53. **Intercalation of Sodium Ions into Hollow Iron Oxide Nanoparticles** Koo B, *et al. Chemistry of Materials* 25(2):245-252. (2013)
54. **Compositional Tuning of Structural Stability of Lithiated Cubic Titania via a Vacancy-Filling Mechanism under High Pressure** Hui X, *et al. Physical Review Letters* 110(7):078304 (078305 pp.)-078304 (078305 pp.). (2013)
55. **Facile Oxidative Conversion of TiH2 to High-Concentration Ti^{3+}-Self-Doped Rutile TiO2 with Visible-Light Photoactivity** Grabstanowicz LR, *et al. Inorganic Chemistry* 52(7):3884-3890. (2013)
56. **CO2 Preactivation in Photoinduced Reduction via Surface Functionalization of TiO2 Nanoparticles** Finkelstein-Shapiro D, *et al. Journal of Physical Chemistry Letters* 4(3):475-479. (2013)
57. **Nanostructured TiO2/Polypyrrole for Visible Light Photocatalysis** Dimitrijevic NM, *et al. Journal of Physical Chemistry C* 117(30):15540-15544. (2013)
58. **Titanium Dioxide Nanomaterials: Introduction** Chen X, Li C, Rajh T, & Kimmel G *Journal of Materials Research* 28(3):269-269. (2013)
59. **High-Performance Bioassisted Nanophotocatalyst for Hydrogen Production** Balasubramanian S, Wang P, Schaller RD, Rajh T, & Rozhkova EA *Nano Letters* 13(7):3365-3371. (2013)
60. **Self-Improving Anode for Lithium-Ion Batteries Based on Amorphous to Cubic Phase Transition in TiO2 Nanotubes** Xiong H, *et al. Journal of Physical Chemistry C* 116(4):3181-3187. (2012)
61. **Cross-linked Heterogeneous Nanoparticles as Bifunctional Probe** Wang M, *et al. Chemistry of Materials* 24(13):2423-2425. (2012)
62. **Nanostructured Bilayered Vanadium Oxide Electrodes for Rechargeable Sodium-Ion Batteries** Tepavcevic S, *et al. Acs Nano* 6(1):530-538. (2012)
63. **Room Temperature Synthesis of Ti-MCM-48 and Ti-MCM-41 Mesoporous Materials and Their Performance on Photocatalytic Splitting of Water** Peng R, Zhao D, Dimitrijevic NM, Rajh T, & Koodali RT *Journal of Physical Chemistry C* 116(1):1605-1613. (2012)
64. **Speciation of L-DOPA on Nanorutile as a Function of pH and Surface Coverage Using Surface-Enhanced Raman Spectroscopy (SERS)** Lee N, *et al. Langmuir* 28(50):17322-17330. (2012)

65. **Hollow Iron Oxide Nanoparticles for Application in Lithium Ion Batteries** Koo B, *et al. Nano Letters* 12(5):2429-2435. (2012)
66. **Ultrafast Charge Separation from Highly Reductive ZnTe/CdSe Type II Quantum Dots** Jin S, Zhang J, Schaller RD, Rajh T, & Wiederrecht GP *Journal of Physical Chemistry Letters* 3(15):2052-2058. (2012)
67. **Dynamics of Interfacial Charge Transfer to Formic Acid, Formaldehyde, and Methanol on the Surface of TiO2 Nanoparticles and Its Role in Methane Production** Dimitrijevic NM, Shkrob IA, Gosztola DJ, & Rajh T *Journal of Physical Chemistry C* 116(1):878-885. (2012)
68. **Synthesis and Characterization of Wurtzite ZnTe Nanorods with Controllable Aspect Ratios** Zhang J, *et al. Journal of the American Chemical Society* 133(39):15324-15327. (2011)
69. **Amorphous TiO2 Nanotube Anode for Rechargeable Sodium Ion Batteries** Xiong H, Slater MD, Balasubramanian M, Johnson CS, & Rajh T *Journal of Physical Chemistry Letters* 2(20):2560-2565. (2011)
70. **Quantum Confinement Effects on the Surface Enhanced Raman Spectra of Hybrid Systems Molecule-TiO2 Nanoparticles** Tarakeshwar P, Finkelstein-Shapiro D, Rajh T, & Mujica V *International Journal of Quantum Chemistry* 111(7-8):1659-1670. (2011)
71. **Surface-Enhanced Raman Scattering on Semiconducting Oxide Nanoparticles: Oxide Nature, Size, Solvent, and pH Effects** Tarakeshwar P, Finkelstein-Shapiro D, Hurst SJ, Rajh T, & Mujica V *Journal of Physical Chemistry C* 115(18):8994-9004. (2011)
72. **Multifunctional Nano-bio Materials Within Cellular Machinery** Rozhkova EA, *et al. International Journal of Nanoscience* 10(4-5):899-908. (2011)
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Technical Reports: Patents and Invention Disclosures

Patent Applications:

- 20110039341 - Method for detecting nucleotide polymorphisms using semiconductor particles
- 20070007512 - Bio-inorganic conjugates
- 20050032092 - Use of metal oxide semiconductors to manipulate biological molecules

Patents:

- 11,619,580 Resonator-based ion-selective sensor

- 17/065,670 High capacity electrode materials for batteries and process for their manufacture
- 0,696,614 Photocatalytic reduction of carbon dioxide to methanol or carbon monoxide using cuprous oxide.
- 10,525,146 Metal oxide nanoparticle for cell lysis
- 10,220,378 Semiconductor-metal nanoparticle hybrids with natural and artificial proton pump for hydrogen production
- 9,991,512 Thermally conductive lithium ion electrodes and batteries
- 9,935,314 High capacity electrode materials for batteries and process for their manufacture
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- 9,107,895 Methods and compositions for imaging cancer cells
- 8,269,100 Hybrid solar cells via UV-polymerization of polymer precursor
- 7,981,261 Integrated device and substrate for separating charged carriers and reducing photocorrosion and method for the photoelectrochemical production of electricity and photocatalytic production of hydrogen
- 6,677,606 Dopa and dopamine modification of metal oxide semiconductors, method for attaching biological molecules to semiconductors
- 6,410,935 Semiconductor assisted metal deposition for nanolithography applications
- 6,271,130 Semiconductor assisted metal deposition for nanolithography applications

Invited Seminars and Colloquia

- Over 100 invited presentations and keynote lectures at international scientific meetings and leading Universities.

- Over 10 presentations for general public on how Nanoscience and Nanotechnology open new business opportunities (Holland & Knight, LLP, MIT Forum, ChemFarma, IAEA Wien Austria, McGuire Woods Law Firm, etc.)

SEMINARS and COLLOQUIA

1. SIZE QUANTIZATION EFFECT IN SEMICONDUCTOR COLLOIDS STUDIED BY STOPPED FLOW TECHNIQUES
   Invited, Solar Energy Research Institute, Golden, Colorado, Colorado ; University, Boulder, Colorado, 1985
2. OPTICAL AND CHEMICAL PROPERTIES OF SURFACE MODIFIED COLLOIDS
   Institute Seminar Series, Chemistry Department, Hebrew University, Jerusalem, March, 1987
3. HETEROGENEOUS PHOTOCATALYSIS AND APPLICATIONS
   Seminar Series, Faculty of Physical Chemistry, University of Belgrade, February, 1991
4. CONVERSION OF HOLES INTO REDUCING SPECIES ON SURFACE MODIFIED SMALL-PARTICLE TiO_2
   Oral Presentation, Conference on "Chemical Oxidation: Technology for the Nineties", Nashville, Tennessee, February, 1995
5. SURFACE MODIFICATION OF SMALL PARTICLE TiO_2 FOR HEAVY METAL REDUCTION
   Invited, National Renewable Energy Laboratory, Golden, Colorado, March, 1995
6. BIOMIMETIC TiO_2 PHOTOCATALYSIS - A MODEL SYSTEM FOR PHOTOSYNTHESIS
   Monday Morning Seminar Series, Chemistry Division, Argonne National Laboratory, Argonne, Illinois, February, 1996
7. IMPROVED CHARGE SEPARATION PROCESSES IN SURFACE MODIFIED TiO_2 COLLOIDS
   Oral Presentation, 2nd Technical Women's Symposium, Argonne National Laboratory, Argonne, Illinois, April, 1996

8. SURFACE MODIFICATION OF TiO_2: CORRELATION BETWEEN STRUCTURE, CHARGE SEPARATION AND REDUCTION PROPERTIES
   Invited seminar, Illinois Institute of Technology, Chicago, IL, October 23, 1996
9. CHARGE SEPARATION PROCESSES IN SELF-ORGANIZED TiO_2 NANOPARTICLES
   T. Rajh, D. M. Tiede, P. Thiyagarajan, and M. C. Thurnauer
   Invited talk, 21st DOE Solar Photochemistry Research Conference, Copper Mountain, Colorado, June 7-11, 1997
10. WHAT IS UNIQUE ABOUT TiO_2 NANOPARTICLES IN PHOTOCATALYSIS?
    Invited talk, Nanotechnology and Quantum Computing Group Seminar, Argonne National Laboratory, Argonne, Illinois, September 18, 1997
11. PHOTOREDUCTION OF COPPER ON TiO_2 NANOPARTICLES MODIFIED WITH POLYDENTATE LIGANDS
    T. Rajh, L. X. Chen, D. M. Tiede, and M. C. Thurnauer
    Oral presentation, 3rd Intl. Conference on TiO_2 Photocatalytic Purification and Treatment of Water and Air, Orlando, Florida, September 23-26, 1997
12. CORRELATION OF SURFACE STRUCTURE WITH UNIQUE CHEMISTRY OF NANOCRYSTALLINE TiO_2
    Invited talk, University of St. Louis, Chemistry Division, St. Louis, April 14, 1998
13. MEASUREMENT OF STRUCTURE AND STRUCTURAL CHANGE FOR PHOTOCHEMICAL SYSTEMS IN NON-CRYSTALLINE ENVIRONMENTS
    D. M. Tiede, M. Firestone, R. Zhang, P. Thiyagarajan, T. Rajh and M. C. Thurnauer
    Talk, 22nd DOE Solar Photochemistry Research Conference, Chantilly, Virginia, June 7-10, 1998
14. UNIQUE STRUCTURE AND CHEMISTRY OF NANOCRYSTALLINE TiO_2
    Invited talk, 9th Annual Symposium Ion Radical Chemistry and 15th International Conference on Radical Ions, Rochester, New York, August 5-9, 1998
15. IMPROVING OPTICAL AND CHARGE SEPARATION PROPERTIES OF NANOCRYSTALLINE TiO_2 BY SURFACE MODIFICATION WITH VITAMIN C
    T. Rajh, O. Poluektov and M. C. Thurnauer
    Invited talk, 217th ACS National Meeting, Anaheim, California, March 21-25, 1999
16. PHOTOCHEMICAL ARRAYS FORMED BY SPATIA COMPARTMENTALIZATION OF COLLOIDAL NANOPARTICLES IN A POLYMER-BASED HYDROGEL
    M. A. Firestone, T. Rajh, O. V. Marakova, S. Seifert, D. M. Tiede and M. C. Thurnauer
    Talk, 219th National ACS Meeting, San Francisco, CA, March 26-30, 2000
17. STRATEGIES TO IMPROVE CHARGE SEPARATION DISTANCES IN SURFACE-MODIFIED TiO_2
    T. Rajh, M. Thurnauer and O. Poluektov
    Talk, Pacifichem 2000, The 2000 Intl. Chemical Congress of Pacific Basin Societies, Honolulu, HI, December 14-19, 2000
18. EARLY STAGES OF PHOTOINDUCED CHARGE SEPARATION IN SURFACE MODIFIED METAL OXIDE NANOPARTICLES
    T. Rajh, L. X. Chen, T. Liu, O. Poluektov, A. D. Trifunac, D. M. Tiede, and M. C. Thurnauer
    Invited talk, 24th DOE Solar Photochemistry Conference, Tahoe City, CA, June 3-7, 2001
19. SURFACE MODIFICATION OF TiO_2 NANOPARTICLES FOR SELECTIVE ADSORPTION OF NITROBENZENE
    T. Rajh, O. V. Makarova, M. C. Thurnauer, P. A. Kemme and D. Cropek
    Invited talk, 222nd National ACS Meeting, Chicago, Illinois, August 26-30, 2001
20. SURFACE RESTRUCTURING OF NANOPARTICLES: AN EFFICIENT ROUTE FOR BIOMOLECULE-NANOPARTICLE CROSSTALK
    T. Rajh, L. X. Chen, T. Liu, D. M. Tiede and M. C. Thurnauer
    Invited talk, 222nd National ACS Meeting, Chicago, Illinois, August 26-30, 2001
21. EPR STUDIES OF DEGUSSA P25 PHOTOCHEMISTRY: INSIGHT INTO MIXED-PHASE TITANIUM DIOXIDE CATALYTIC ACTIVITY
    D. Hurum, A. G. Agrios, K. A. Gray, T. Rajh and M. C. Thurnauer
    Invited talk, 222nd National ACS Meeting, Chicago, Illinois, August 26-30, 2001
22. SURFACE RESTRUCTURING OF TiO_2 NANOPARTICLES REVEALED BY X-RAY SPECTROSCOPIES
    T. Rajh, L. X. Chen, T. Liu, D. M. Tiede and M. C. Thurnauer
    Invited talk, 11th Users Meeting at the APS, Argonne National Laboratory, October 9-11, 2001

23. PHOTOINDUCED CHARGE SEPARATION IN SURFACE MODIFIED TiO_2 NANOPARTICLES REVEALED BY ELECTRON SPIN POLARIZATION
    M. C. Thurnauer, T. Rajh, O. G. Poluektov, and A. D. Trifunac
    Invited talk, 13th Winter Meeting of the Inter-American Photochemical Society, Tempe, AZ, January 2-5, 2002
24. SURFACE RESTRUCTURING OF METAL OXIDE PARTICLES: AN EFFICIENT ROUTE FOR EXTENDED CHARGE SEPARATION
    T. Rajh, Z. Saponjic, L. X. Chen, M. C. Thurnauer, and D. M. Tiede
    Invited talk, Nanohybrid Structures Workshop, James Franck Institute, The University of Chicago, November 15-16, 2002
25. PHOTOCATALYSIS USING EPR AND/OR TIME-RESOLVED TECHNIQUES
    Invited talk, A Workshop on Selectivity in Catalysis, Argonne National Laboratory, Argonne Guest House, Conference Room A., December 3, 2002
26. HEALING OF NANOPARTICLE SURFACES: OPPORTUNITY FOR THE DESIGN OF FUNCTIONAL MATERIALS ON NANOSCALE
    T. Rajh, Z. Saponjic, N. M. Dimitrijevic, L. X. Chen, M. C. Thurnauer, D. M. Tiede, P. Zapol, M. Vega, and L. Curtiss
    Invited talk, Nano-Lunch Seminar Series, Argonne National Laboratory, April 16, 2003
27. THE BIO-INORGANIC INTERFACE
    CNM Science Advisory Committee, ANL, May 9, 2003
28. RESTRUCTURING OF NANOPARTICLE SURFACES AND CHARGE TRANSFER ACROSS NANOPARTICLE SURFACES
    T. Rajh, L. X. Chen, Z. Saponjic, N. M. Dimitrijevic, G. Wiederrecht, P. Zapol, M. Vega, L. Curtiss, M. C. Thurnauer, and D. M. Tiede
    Invited talk, APS User Science Seminar, ANL, May 17, 2003
29. HEALING OF NANOPARTICLE SURFACES: OPPORTUNITY FOR THE DESIGN OF FUNCTIONAL MATERIALS ON NANOSCALE
    T. Rajh, Z. Saponjic, N. M. Dimitrijevic, P. Zapol, L. X. Chen, D. M. Tiede, and M. C. Thurnauer
    Invited talk, 26th DOE Solar Photochemistry Research Conference, Tahoe City, CA, June 8-12, 2003
30. HEALING OF NANOPARTICLE SURFACES FACILITATE CHARGE TRANSFER ACROSS NANOPARTICLE JUNCTIONS
    T. Rajh, Z. Saponjic, N. M. Dimitrijevic, L. X. Chen, P. Zapol, M. Vega, L. Curtiss, M. C. Thurnauer, and D. M. Tiede
    Invited talk, Center for Nanoscale Materials Workshop: Grand Challenges in Modeling the Assembly and Properties of Nanomaterials, ANL, August 20-23, 2003
31. SPIN POLARIZATION MECHANISMS AND OPTICAL PROPERTIES OF EXCESS ELECTRONS IN TiO_2 NANOSTRUCTURES
    T. Rajh, Z. Saponjic, N. M. Dimitrijevic, D. Bartels, L. X. Chen, O. Poluektov, M. C. Thurnauer, and D. M. Tiede
    Invited talk, 226th ACS National Meeting, New York, NY, September 7-11, 2003
32. HYBRID BIO-INORGANIC STRUCTURES FACILITATE CHARGE TRANSFER ACROSS NANOPARTICLE INTERFACES
    Invited talk, NU-ANL Nanoscience Workshop, Northwestern University, Evanston, IL, October 22, 2003
33. BIO-INORGANIC STRUCTURES
    Talk, LDRD Mini Symposium Series, ANL, October 27, 2003
34. TOWARD SELECTIVE MANIPULATION OF BIOMOLECULES USING METAL OXIDE NANOPARTICLES
    Talk, Notre Dame-ANL Nanoscience Worskhop, Notre Dame University, South Bend, IN, January 23, 2004
35. RADIOLYTIC HYDROGEN PRODUCTION
    Talk, Catalysis Team Meeting, ANL, January 28, 2004
36. TOWARD SELECTIVE MANIPULATION OF BIOMOLECULES
    Invited talk, Biodiscussion Group, Biological Sciences Divisional Seminar, ANL, February 2, 2004
37. WELDING BIOMOLECULES TO NANOPARTICLES
    Invited Talk, Materials Science Colloquium, ANL, February 12, 2004

38. MECHANISMS OF SEMICONDUCTOR ASSISTED PHOTOCATALYSIS REVEALED VIA ELECTRON PARAMAGNETIC RESONANCE
    T. Rajh, M. C. Thurnauer, K. A. Gray, D. C. Hurum, A. Agrios and O. V. Makarova
    Invited talk, 227th ACS National Meeting, Anaheim, CA, March 28-April 1, 2004
39. TOWARD ELECTRONICALLY COUPLED BIO-INORGANIC CONJUGATES
    D. Gosztola, Z. Saponjic, L. X. Chen, N. M. Dimitrijevic, L. de al Garza, and T. Rajh
    Invited talk, 205th Electrochemical Society Meeting, San Antonio, TX, May 9-14, 2004
40. RESOLVING CONFORMATIONAL ENVELOPES OF DESIGNED PHOTOSYNTHETIC ARCHITECTURES
    D. M. Tiede, L. X. Chen, T. Rajh, X. Zuo, R. Zhang, L. Yu, J. S. Lindsey, J. O'Donnell, J. Hupp, and F. Lewis
    Invited talk, 27th DOE Solar Photochemistry Research Conference, Airlie Conference Center, Airlie, VA, June 6-9, 2004
41. DESIGN AND CHARGE TRANSFER IN TiO2 HYBRID ARCHITECTURES USING AVIDIN-BIOTIN CONNECTORS
    N.M. Dimitrijevic, Z.V. Saponjic, B.M. Rabatic, T. Rajh
    Invited talk, 206th Meeting of the Electrochemical Society, Honolulu, HI, Oct. 3-8, 2004
42. HEALING OF NANOPARTICLE SURFACES: OPPORTUNITIES FOR THE DESIGN OF BIOINORGANIC HYBRID SYSTEMS FOR ENERGY CONVERSION
    T. Rajh, N. M. Dimitrijevic, J. Liu, Z. Saponjic, L. de la Garza, and B. M. Rabatic
    Invited talk, Chemistry, Biology, and Material Science towards Creating New Science and Industry based on Inter-nanoscience, Osaka University, Osaka, Japan, Feb. 21-24, 2005
43. BIO-INSPIRED SELF ASSEMBLY
    T. Rajh, J. Liu, N.M. Dimitrijevic, Z.V. Saponjic, B.M. Rabatic
    PBCS Workshop Presentations - March 9, 2005
44. NANOSCIENCE AT ARGONNE AND THE CENTER FOR NANOSCALE MATERIALS
    Tijana Rajh, Millicent Firestone, David Tiede, and Eric Isaacs
    DOE-NIH Nanobiotechnology Workshop, Bethesda, ML, March 17-18, 2005
45. EPR STUDY OF Mn-DOPED TiO2 NANOPARTICLES
    Z. Saponjic, N.M. Dimitrijevic, L. Chen, D.M. Tiede, and T. Rajh
    Invited talk, American Physical Society March Meeting 2005, Los Angeles, CA, March 21-25, 2005
46. OPPORTUNITIES FO THE DESIGN OF HYBRID SYSTEMS
    T. Rajh, N.M. Dimitrijevic, J. Liu, Z.V. Saponjic, L. De la Garza, and B.M. Rabatic
    Invited Talk, Chemistry Department Seminar Series, Southern Illinois University, Carbondale, IL, April 8, 2005
47. SPATIALLY CONFINED DEFECTS INDUCE CHEMICAL FUNCTIONALITY OF ANISOTROPIC TiO_2 RODS
    B. M. Rabatic, N. M. Dimitrijevic, r. E. Cook, Z. V. Saponjic, and T. Rajh
    Talk, Microscopy and Microanalysis 2005, Honolulu, HA, July 31 – Aug. 4, 2005
48. SEMICONDUCTOR ASSISTED CHARGE TRANSFER IN DUPLEX AND TRIPLEX DNA
    J. Liu, Z. Saponjic, N. Dimitrijevic, and T. Rajh
    Invited talk, 24th Miller Conference on Radiation Chemistry, La Londe les Maures, France, September 10-15, 2005
49. PHOTOELECTROCHEMICAL DETECTION OF DNA HYBRIDIZATION
    L. de la Garza, Z. V. Saponjic, N. M. Dimitrijevic, M. C. Thurnauer, and T. Rajh
    Talk, 208th Meeting of the Electrochemical Society, Los Angeles, CA, Oct. 16-21, 2005
50. METAL WIRES ENCAPSULATED WITHIN TiO_2 NANOTUBES
    B. M. Rabatic, Z. V. Saponjic, and T. Rajh
    Poster, 2005 MRS Fall Meeting, Boston, MA, Nov. 28 – Dec. 2, 2005
51. EXTENDED CHARGE SEPARATION IN ELECTRONICALLY COUPLED TiO_2 NANOPARTICLES AND DNA
    T. Rajh, J. Liu, Z. Saponjic, N. Dimitrijevic, and L. de la Garza
    Invited talk, ACS Great Lakes Regional Meeting, Milwaukee, WI, May 31-June 2, 2006
52. COUPLING OF TiO_2 NANOCRYSTALLITES TO PROTEINS
    N. M. Dimitrijevic, Z. V. Saponjic, and T. Rajh
    Invited talk, 28th DOE Photochemistry Research Conference, Airlie, VA, June 4-7, 2006
53. SURFACE RECONSTRUCTION: AN OPPORTUNITY FOR IMPROVING SOLAR ENERGY CONVERSION

Invited talk, Material research Society Meeting, Boston, November 27th, 2006.

54. NANOPARTICLES, NUCLEIC ACIDS, AND PROTEINS: ELECTRONICS MEETS BIOLOGY
    Invited talk, Biosciences Division, ANL, November 9th, 2006.
55. BIOINORGANIC HYBRID SYSTEMS FOR LIGHT ENERGY CONVERSION
    invited talk, Bejing National Lab for Molecular Sciences, Chinese Academi of Sciences, Bejing, China, April 2nd, 2007.
56. ENERGY AND INFORMATION TRANSDUCTION AT BIO-HYBRID INTERFACES
    SAC Review, April 10th, 2007.
57. ENERGY AND INFORMATION TRANSDUCTION AT BIO-HYBRID INTERFACES
    DOE BES Review, May 2nd, 2007.
58. NANOBIO HYBRID INTERFACE FOR ENERGY TRANSDUCTION
    US-France Workshop, June 3rd, 2007.
59. NANOPARTICLES, NUCLEIC ACIDS AND PROTEINS: AN OPPORTUNITY FOR ENERGY CONVERSION AT NANOSCALE
    Invited talk, Illinois Institute of Technology, September 14th, 2007.
60. SURFACE RECONSTRUCTION OF NANOPARTICLES: AN OPPORTUNITY FOR IMPROVING LIGHT ENERGY CONVERSION
    T. Rajh, L. Zhang, E. Rozhkova, Z. Saponjic, N.M. Dimitrijevic, L. de la Garza, CINT, Sandia National Laboratory, December 5th, 2007
61. SURFACE RECONSTRUCTION OF NANOPARTICLES: AN EFFICIENT ROUTE FOR ETENDED CHARGE SEPARATION
    T. Rajh, L. Zhang, E. Rozhkova, Z. Saponjic, N.M. Dimitrijevic, CNST Nanotechnology Seminar Series, NIST, January 17th, 2008
62. NANOPARTICLES, NUCLEIC ACTIDS AND PROTEINS: FROM ENERGY CONVERSION TO CELL MANIPULATION
    T. Rajh, L. Zhang, E. Rozhkova, Z. Saponjic, N.M. Dimitrijevic, 2007 Scientific Conference on Chemical & Biological Defense Research, 13-15 November 2007 at the Holiday Inn Select (soon to be Crowne Plaza Baltimore North, Timonium, Maryland, USA.
63. ENERGY AND TRANSDUCTION AT NANOBIO INTERFACES
    T. Rajh, L. Zhang, E. Shevchenko, E. Rozhkova, P. Redmond, N.M. Dimitrijevic, NSC-NSF SBE&S Workshop, 18-22 February 2008, National Cheng Kung University, Tainan City, Taiwan
64. TUNNING NANOPARTICLE INTERFACES FOR ENHANCED PHOTOVOLTAIC RESPONSE
    N. M. Dimitrijevic, S. Tepavcevic, O. Poluektov, S. B. Darling, S. J. Sibener, T. Rajh, SPIE San Diego, August 10-14th, 2008
65. NANOPARTICLES, NUCLEIC ACID AND PROTEINS: FROM ENERGY CONVERSION TO CELL MANIPULATION
    T. Rajh, A. Musumeci, D. Martin, E. Rozhkova, N.M. Dimitrijevic
    5th Annual Conference ARC Center for Functional Materials, The University of Queensland, QLD, Australia, November 5-7th, 2008
66. SURFACE RESTRUCTURING OF NANOPARTICLES AFFECTS CHARGE SEPARATION
    T. Rajh, N.M. Dimitrijevic, E. Rozhkova, E. Shevchenko, L. De la Garza
    238th ACS National Meeting, Washington DC, August 20, 2009
67. TUNING NANOPARTICLE SURFACE FOR EXTENDED CHARGE SEPARATION
    T. Rajh, N.M. Dimitrijevic
    Auburn University, October 16, 2009
68. NANOSCIENCE AND NANOTECHNOLOGY: FROM ENERGY APPLICATIONS TO ADVANCED MEDICAL THERAPIES
    Invited talk, University of Chicago, Holland & Knight, LLP, September 24, 2009
69. NANOSCIENCE AND NANOTECHNOLOGY
    Invited talk, Fermilab Colloquium, October 14, 2009
70. HEALING OF NANOPARTICLE SURFACES: AN OPPORTUNITY FOR IMPROVED ENERGY CONVERSION
    Invited talk, ANL Physics Colloquium, October 30, 2009
71. NANOSCIENCE AND NANOTECHNOLOGY: FROM ENERGY APPLICATIONS TO ADVANCED MEDICAL THERAPIES
    Invited talk, ChemPharma® Professional Association Event, Oakbrook Terrace, IL, November 16, 2009
72. NANOSCIENCE AND NANOTECHNOLOGY
    Invited talk, MIT Enterprise Forum, Madison Conference Center, Chicago IL, February 16, 2010

73. TUNING NANOPARTICLE SURFACE FOR EXTENDED CHARGE SEPARATION
    T. Rajh, N.M. Dimitrijevic,Auburn University, October 16, 2009
74. NANOSCIENCE AND NANOTECHNOLOGY: FROM ENERGY APPLICATIONS TO ADVANCED MEDICAL THERAPIES
    T. Rajh, Invited talk, University of Chicago, Holland & Knight, LLP, September 24, 2009
75. NANOSCIENCE AND NANOTECHNOLOGY
    T. Rajh Invited talk, Fermilab Colloquium, October 14, 2009
76. HEALING OF NANOPARTICLE SURFACES: AN OPPORTUNITY FOR IMPROVED ENERGY CONVERSION
    T. Rajh, Invited talk, ANL Physics Colloquium, October 30, 2009
77. NANOSCIENCE AND NANOTECHNOLOGY: FROM ENERGY APPLICATIONS TO ADVANCED MEDICAL THERAPIES
    T. Rajh, Invited talk, ChemPharma® Professional Association Event, Oakbrook Terrace, IL, November 16, 2009
78. NANOSCIENCE AND NANOTECHNOLOGY
    T. Rajh ,Invited talk, MIT Enterprise Forum, Madison Conference Center, Chicago IL, February 16, 2010
79. NANOBIO INTERFACE GROUP AT THE CENTER FOR NANOSCALE MATERIALS
    T. Rajh , IAEA meting, Vienna, March 13-19th, 2010
80. ENERGY AND INFORMATION TRANSDUCTION AT BIO-HYBRID INTERFACES
    T. Rajh , SAC Committee, CNM Argonne National Laboratory, March 2010
81. NANOPARTICLES, NUCLEIC ACIDS AND PROTEINS: FROM ENERGY CONVERSION TO CELL MANIPULATION
    T. Rajh , Invited talk, Department of Educational Programs, June 16th, 2010
82. NANOPARTICLES, NUCLEIC ACIDS AND PROTEINS: A ROUTE FOR ADVANCED MEDICAL THERAPIES
    T. Rajh , AVAC Meeting, 77 Wacker Drive (McGuire Woods Law Firm)
83. NANOPARTICLE-BASED RAMAN DYES AND CHEMICAL MECHANISM OF ENHANCEMENT
    S. Hurst, D. Finkestein-Shapiro, C. Fry, V. Mujica, T. Rajh , Invited talk, American Chemical Society Meeting, Boston August 20-26, 2010
84. SURFACE MODIFICATION OF NANOPARTICLES FOR ENHANCED CHARGE SEPARATION,
    S. Hurst, D. Finkestein-Shapiro, C. Fry, V. Mujica, T. Rajh , Arizona State University, The Professional Science Master's (PSM) in Nanoscience, October 11, 2010
85. LIGHT ACTIVE BIOFUNCTIONALIZED TiO_2 BASED NANOCOMPOSITES S. Hurst, D. Finkestein-Shapiro, C. Fry, V. Mujica, T. Rajh University of Pennsylvania, Department of Chemistry and Materials Science combined seminar, March 17, 2011
86. TUNING NANOPARTICLE INTERFACE FOR EXTENDED CHARGE SEPARATION
    S. Hurst, D. Finkestein-Shapiro, C. Fry, V. Mujica, T. Rajh , US-India-Israel Workshop on Soft & Hybrid Matter, Ryan Hall, Northwestern University, Evanston March 23-35, 2011
87. NANOSCALE ARCHITECTURES FOR BATTERY APPLICATIONS
    Xiong, H.; Tepavcevic, S.; Yildirim, H.; Koo, B.; Shevchenko, E.; Johnson C. and Rajh. T. , Electrical Energy Storage Workshop, Argonne National Laboratory, April 4, 2011
88. NANOBIO INTERFACES
    Rajh. T. MSD Brainstorming Day, Argonne National Laboratory. April 20, 2011
89. NANOPARTICLE COMPOSITES FROM CATALYSIS TO ENGINEERING BIOLOGY,
    Rajh. T. Shevchenko E., Rozhkova, E. Fyr, H.C., DOE Contractor's Meeting, Virginia. 2011
90. NANOARCHITECTURES FOR ENERGY STORAGE
    Johnson, C.; Xiong, H.; Koo, B.; Tepavcevic, S.; Slater, M.; Yildirim, H.; Shevchenko, E. and Rajh. T. , ECS Spring Meeting, Montreal, Canada (May 2011).
91. THREE-DIMENSIONAL ARCHITECTURES OF METAL OXIDE FOR Li-ION BATTERIES,
    Xiong, H.; Johnson, C. and Rajh, T ECS Fall Meeting, Las Vegas, NV (October 2010).
92. PLASMONIC NANO-ANTENNAS TO ENHANCE LIGHT SENSITIVITY OF RETINAL MOLECULAR DEVICES DESIGNED FOR VISION RESTORATION
    D.R. Pepperberg, L. Yue, M. Pawlowski, S.J. Hurst, K.S. Bruzik, T. Rajh Beckman Initiative for Macular Research, Beckman Center of the National Academies of Science and Engineering, Irvine, CA, January 20-22, 2011.
93. NANOSTRUCTRED BILAYERED VANADIUM OXIDE ELECTRODES FOR RECHARGEABLE SODIUM-ION BATTERIES

Sanja Tepavcevic, Vojislav Stamenkovic, Christopher S. Johnson, Tijana Rajh Contributed Talk, 2011 MRS Fall Meeting, November 27-December 3, 2011.

94. AMORPHOUS TiO2 NANOTUBE BASED ANODE FOR LI-ION AND NA-ION BATTERIES, Xiong, H; Yildirim, H; Shevchenko, EV; Prakapenka, VB; Slater, MD; Balasubramanian, M; Sankaranarayanan, SKRS; Greeley, JP; Tepavcevic, S; Dimitrijevic, NM; Podsiadlo, P; Johnson, CS; Rajh, T; Contributed Talk, MRS Fall Meeting 2011, Boston MA, November 26-30, 2011.
95. NANOSTRUCTURED NA-ION FULL-CELLS,
S. Tepacevic , C. Xiong, , T. Rajh Christopher S. Johnson, Contributed Talk, 2012 MRS Spring Meeting, San Francisco, CA, April 9-April 13, 2012
96. INTERRELATIONSHIP BETWEEN Na-ION AND Li-ION BATTERIES
D. Kim, E. Lee, M.Slater, C. Xiong, S. Tepacevic, T. Rajh Christopher S. Johnson, Invited Talk, IBA-PPSS, 2012 Waikoloa, Hawaii, January 12 (2012)
97. LIGHT ACTIVE BIOFUNCTIONALIZED TiO2 BASED NANOCOMPOSITES
Rajh, T., Massich, M., Blaiszick B., Rozhkova, E., Dimitrijevic N.M.
Nanobiomaterials Conference, Lanzarote, Spain February 16-19, 2013
98. NANOSCIENCE AND NANOTECHNOLOGY: FROM ENERGY APPLICATIONS TO ADVANCED MEDICAL THERAPIES,
Rajh, T. Massich, M., Blaiszick B., Rozhkova, E., Dimitrijevic N.M. C. Xiong, S. Tepacevic, Christopher S. Johnson
AICHE National Meeting, IIT Chicago, January 17, 2013
99. CO_2 PRE-ACTIVATION VIA CHARGE TRANSFER STATES OF TIO_2-AMINOSALICYLIC ACID COMPLEXES,
T. Rajh, A. Musumeci, V. Mujica, D. Finkelstein-Sapiro
ACS National Meeting, New Orleans, April 12, 2013.
100. LIGHT ACTIVE BIOFUNCTIONALIZED TiO2 BASED NANOCOMPOSITES,
Rajh, T. Massich, M., Blaiszick B., Rozhkova, E., Dimitrijevic N.M.
Zing Conference on Nanomaterials in Biological Systems, Lanzarote, Canary Islands, February 14, 2013
101. ELECTROACTIVE BIOCOMPOSITES: FROM NANOSURGEONS TO ENERGY GRADIENT ARCHITECTURES,
Rajh, T. Massich, M., Blaiszick B., Rozhkova, E., Dimitrijevic N.M. C. Xiong, S. Tepacevic, Christopher S. Johnson
Ohio University October 10th 2013.
102. METAL OXIDE NANOCOMPOSITES,
Rajh T.
Northen Illinois University, May 2013.
103. NANOARCHITECTURE ELECTRODES FOR LI- AND NA-ION BATTERIES,
Johnson, Christopher; Xiong, Hui; Tepavcevic, Sanja; Rajh, Tijana, 246th National Meeting of the American-Chemical-Society (ACS), Indianapolis, IN , 2013
104. ELECTROACTIVE BIOCOMPOSITES WITHIN CELL MACHINERY,
Rajh, T. Massich, M., Blaiszick B., Rozhkova, E., Dimitrijevic N.M. C. Xiong, S. Tepacevic, Christopher S. Johnson
International Workshop on Nanoscale Spectroscopy and Nanotechnology (NSS) 8, Chicago, July 28-31, 2014
105. USING TiO2 NANOCONJUGATES FOR TREATMENT OF CANCER CELLS
Tamara Koritarov Vani Konda, Riba Mustafi, Marc Bissonnette, Tijana Rajh, SPASEC 19 San Diego, California, USA November 17-20, 2014 – Plenary Talk
106. VERSATILITY OF TiO2 NANOPARTICLES: FROM BATTERIES TO MEDICAL THERAPIES,
T. Rajh, Rozhkova, E., Dimitrijevic N.M.
New Hamphshire University, March 12th 2015.
107. NANOSTRUCTURED LAYERED CATHODE FOR RECHARGEABLE Mg-ION BATTERIES,
Sanja Tepavcevic, Yuzi Liu, Barry Lai, Jörg Maser, Vojislav Stamenkovic, Christopher Johnson, Nenad Markovic, Tijana Rajh, MRS Spring Meeting, April 6-10, 2015, San Francisco, California
108. CENTER FOR NANOSCALE MATERIALS UPDATE
T. Rajh,
User Science Horizons, Joint APS/CNM User Meeting, May 19-12, 2016
109. CANCER NANOTECHNOLOGY: AT THE INTERFACE BETWEEN ENGINEERED NANOMATERIALS AND LIVING SYSTEMS

T. Rajh, E. Rozhkova
Physics Division Colloquium, Argonne National Laboratory, October 9th, 2015

110. THE TRANSFORMATIVE IMPACT OF TiO2 NANOPARTICLES
T.Rajh,
Center for Nanaocale Materials, Colloquium, October 15th, 2016
111. AT THE INTERFACE BETWEEN NANOPARTICLES AND LIVING SYSTEMS
T. Rajh
Chemistry Department Seminar, VirginiaTech, Vi, February 5th, 2016
112. MANIPULATING INTERFACES BETWEEN NANOPARTICLES AND LIVING SYSTEMS
T. Rajh,
Chemistry Department, Case Western University, Cleveland OH, March 17, 2016
113. NANOBIO INTERFACE GROUP AT THE CNM
T. Rajh
NST PSE Review, Argonne National Laboratory, September 28-30, 2015.
114. MENTORING
T. Rajh ,
Diversity and Inclusion Council, Argonne National Laboratory, February 18, 2016
115. NANOPARTICLES FOR SENSING AND STIMULATION
T. Rajh,
Brain Workshop, University of Chicago, February 19, 2016
116. POWERING TiO2 NANOPARTICLES IN LIVING SYSTEMS
T. Rajh,
Nano Science and Engineering PhD Program Seminar, South Dakota School of Mines, March 2nd, 2017
117. NANOSTRUCTURED BILAYERED V2O5 CATHODE FOR RECHARGEABLE BATTERIES: Na AND Mg ION CASE
T. Rajh, S. Tepavcevic, Y. Liu, B. Lai, J. Maser, V. Stamenkovic, C. Johnson
253rd ACS National Meeting, April 2-6, 2017, San Francisco, CA
118. PHOTOCATALYSIS FOR CO2 REDUCTION
T. Rajh,
Shanghai University, November 7th 2018, Shanghai, China
119. CNM in Highlights & Future key directions
T. Rajh
Science Advisory Committee, Center for Nanoscale Materials, December 22, 2018, Argonne IL
120. Nanoscience and technology division in Highlights & Future key directions
T. Rajh,
Physical Sciences and Engineering Retreat, January 8th, 2019, Oak Brook, IL
121. Brief description of the CNM scientific research
T. Rajh,
DOE Triannial Review of the Cneter for Nanoscale Materials, June 4, 2019, Argonne IL

Mentoring and Outreach

- PSE Committee for Diversity and Inclusion — 2017-2019
- NST Mentoring Coordinator — 2014-2016
- CNM Mentoring Coordinator — 2010-2014
- Mentoring Subcommittee Diversity and Inclusion Council — 2013-2019t
- Mentoring postdocs and early carrier staff in CNM, CSE, APS — Since 2004
- Member of Argonne National Laboratory Postdoc Committee — 2007-2008
- Mentor for the *Science Undergraduate Laboratory Internships* (SULI) program (sponsored and managed by the Department of Energy's (DOE) Office of Science) — 2002-2014

- Mentor for the *Faculty Laboratory Internship* program (sponsored and managed by the Department of Energy's (DOE) Office of Science) 2010-2013

Current Research Support

BES DOE Materials Science Division (FY 2020-2023) Design, synthesis, and atomic scale characterization of rare-earth based supramolecular nano-graphene and nanoribbons ($4.5M) PI: Hla, Sa, T. Rajh Co-PI

Pending Research Support

BES DOE Materials Science Division (FY 2023-2026) Design, synthesis, and atomic scale characterization of rare-earth based supramolecular nano-graphene and nanoribbons ($4.5M) PI: Hla, S.W., T. Rajh Co-PI

NIH Major Research Instrumentation Program (FY 2023-2026**)** Acquisition of a Helium Closed Loop Cryogenic System for Energy & Sensing Applications using Variable Temperature EPR Spectroscopy ($300K) PI: T.Rajh

BES DOE Science Foundation for Earthshots (FY2023-2026) Ternary Spinel Oxide Nanocrystals as Tunable Platforms for Electro- and Photocatalytic Ammonia Production ($650K) PI: K. E. Knowles, T. Rajh Co-PI

Research Support

BES DOE FWP, Scientific User Facilities (FY 2016 – 2019) Center for Nanoscale Materials, PI: S. Guha.

US_-Israel Binational Science Foundation (BSF) (FY2013-2018), Photocatalytic reduction of CO2 to stable molecules involving TiO2-graphene nano-composites, J. Rabani and T. Rajh PIs.

BES DOE FWP, Scientific User Facilities (FY 2013 – 2016) Center for Nanoscale Materials, PI: A. Roelofs, *Energy and Information Transduction at NanoBio Inetrfaces*, Investigator T. Rajh (**7,200 K**)

Competative Initiative LDRD (FY 12-14) *Curing Cancer with the Power of Fireflies* PI: T. Rajh (**480K**)

S**trategic Energy Initiative LDRD** (FY 10-12) *Nanoscale Architectures for Energy Storage* (**1,500 K**) PIs: T. Rajh, E. Shevchenko, S. Gray, J. Greeley, C. Johnson, V. Stamenkovic

Strategic Energy Initiative LDRD (FY 10-12) *Integrated System for Efficient Solar Energy Harvesting* (**400K**) PIs: Seth Darling, George Crabtree, Jeff Guest, Roy Holt, Matt Pelton, David Potterveld, Tijana Rajh, Elena Shevchenko, Gary Wiederrecht

BES DOE NSEC FWP, (FY 10-13), Center for Nanoscale Materials, PI: A. Petford-Long *Energy and Information Transduction at Bio-hybrid Interfaces*, Investigator T. Rajh (**6,500 K**)

NHMRC Research Grant, Australia (FY 08-11), *Toxycology of Nanoscale Materials*, (**400 K**) PI: Darren Martin

BES DOE NSEC FWP, (FY 07-10), Center for Nanoscale Materials, PI: E. Isaacs *Energy and Information Transduction at Bio-hybrid Interfaces*, Investigator T. Rajh (**5,500 K**)

BES DOE NSET FWP, Chemical Sciences (FY05-May 2007) "*Bioinorganic Hybrid Systems for Light Eneergy Conversion*", PIs: T. Rajh, N.M. Dinitrijevic, P. Zapol, D.M. Tiede, L.X. Chen. (**1,500 K**).

BES DOE Institute for Catalysis and Energy Processes FWP (FY06-09) "*Catalysis and Photocatalytic Chemical Transformations*", PI: P. C. Stair, Investigators: T. Rajh, N. Dimitrijevic (**450 K**)

Dreyfus Foundation in Environmental Chemistry (FY06-08) "*Creation and Characterization of Novel Nano-Metal-Semiconductor Compositesfor Enhanced Photocatalysis and Multi-Electron Chemistry"* Investigators, N. Scherer, T. Rajh – (**300K**)

S**trategic Nanoscience Initiative LDRD** (FY 07-08) entitled: "Manipulation of Biomolecules using Metal Oxide Nanoparticles", Investigators Tijana Rajh and Daphne Preuss (**170 K**).

S**trategic Nanoscience Initiative LDRD** (FY 07-09) entitled: *"Energy Conversion at Bio-hybrid Interfaces"*, Investigators T. Rajh, D.M. Tiede (CHM/CNM), N.M. Dimitrijevic, M. Schiffer (**600 K**)

Strategic Nanoscience Initiative LDRD (FY 07-08) entitled: "*Quantum-dot sensitized mesoporous solar cells" (***160 K**)/year Mike Zach, Zhili Xiao, Jie Li, Wai-Kwong Kwok, Jeff Elam, Nada Dimitrievic, Tijana Rajh, Ulrich Welp.

BES DOE FWP Chemical Sciences (FY03-06): "Reactive Intermediates in Condensed Phase: Radiation and Photochemistry" (**3.300 K**) PIs: T. Rajh, D. Bartels, I/ Shkrob, R. Crowwell, D. Gosztola.

Consortium for Nanoscale Research (FY03-06): "Bio-Nano Composite Materials" (**600 K**) PIs: L Metz (UofC), T. Rajh

BES DOE FWP, Chemical Sciences (FY00-03) "*Hierarchical Photosynthestic Systems*", (**2,700 K**) PIs: TM. Thurnauer, D. Tiede, L.X. Chen, T. Rajh.

Competitive LDRD (FY01-03) *Development of a nano-chip for intracellular manipulations* Investigator(s):T. Rajh, M. Thurnauer, G. E. Woloschak, T. Paunesku (**480 K**)

DOE Office of Energy Research, Laboratory Technology Research Program (FY99-02) – CRADA with Hewlett Packard; "*Photocatalytic Metal Deposition for Nanolithography: Deposition of Conductive Patterns*" (**450 K**) PI: T. Rajh, N. Meshkov.

DOE Office of the Computational and Technology Research, Division of Advanced Energy Projects and Technology Research (FY 97-99) *Photoassisted Removal of Metal Ions using Small Semiconductor Particles* (**750 K**) PIs, T. Rajh, N. Meshkov, M. Thurnauer.

Supervision of Postdocs and Graduate Students

Advised over the Past Ten Years:

Undergraduate: Bryan Jaski (Pharmaceutical Sciences, Ohio State University), Maya Ramamuthry (shared with Oni Basu, Berkeley University); Lucas Beslow (Perdue University), Serwah (Abbey)

Nkansah, Samuel Srajer, Marina Poluektova, Alesia Prakapenka (UIUC); Jenny Hedlund (University of Iowa); Kellen Svetov (Yale University)

Graduate: Fatima Rizvi (University of Illinois at Chicago), Tamara Koritarov (Boston University), Ramadurai Dinakar, (University of Illinois at Chicago, Thesis Committee), Anthony Musumeci (Univ Queensland); Diana Hurum (Northwestern University), Zoran Saponjic (University of Belgrade, Thesis Committee)

Postdoctoral scholars: *Current* Alexander Brugh *Past*: Lei Sun (Westlake University); Dibyendu Kumar Sasmal (Indian Institute of Technology); Benjamin Blaiszik (University of Chicago); Matthew Masich consultant law firm; Hui Xiong (Boise State University) Sarah Hurst (Northwestern University) Jun Zhang (Petroleum University East China) Sanja Tepavcevic (MSD, Argonne); Peter Redmond (shared with Norbert Sherer, University of Chicago, Novelis); Ligang Zhang (Alnylam Pharmaceuticals) Bryan Rabatic (Amoco, IL), Jianqin Liu (Pierce, WI), Zoran Saponjic (Vinca Institute).