GARY WIEDERRECHT

Senior Scientist and Group Leader

Nanophotonics & Biofunctional Structures Group

Center for Nanoscale Materials
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Argonne National Laboratory
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Education

Ph. D. Physical Chemistry, Massachusetts Institute of Technology
B. S. Chemistry, University of California at Berkeley

Awards and honors

2013 Argonne National Laboratory Distinguished Performance Award
2005 Argonne National Laboratory Director's Award
2004 Argonne National Laboratory Pacesetter Award
1998 Presidential Early Career Award for Scientists and Engineers (PECASE)
1998 Department of Energy Young Scientist Award
1996 R&D 100 Award (R&D Magazine) for development of a photorefractive image processor
1987 Elizabeth D. North Prize for academic excellence at UC Berkeley
1986 Society for Applied Spectroscopy Scholarship

Research interests

- Optical energy conversion in nanostructured and biofunctional materials
- Ultrafast energy transport and charge separation
- Quantum optics and sensing
- Optical properties of hybrid nanoparticles

Professional Experience

Argonne National Laboratory - Center for Nanoscale Materials *2016-present*
Senior Scientist and Group Leader, Nanophotonics & Biofunctional Structures Group

- Responsible for the operations and scientific scope of the Nanophotonics & Biofunctional Structures Group at the Center for Nanoscale Materials. The group has 8 regular staff members
- Principal investigator for ultrafast energy transport and optical energy conversion in nanostructured and biomimetic materials, and function as scientific contact for external user scientists in the areas of ultrafast spectroscopy and optical microscopy

Argonne National Laboratory - Center for Nanoscale Materials
Senior Scientist and Group Leader, Nanophotonics Group *2013-2015*
Group Leader, Nanophotonics Group *2007-2013*
Acting Group Leader, Nanophotonics Group *2006-2007*

- Responsible for the operations and scientific scope of the Nanophotonics Group at the Center for Nanoscale Materials. The group had 4 regular staff members
- Principal investigator for ultrafast energy transport and optical energy conversion in nanostructured materials, and function as scientific contact for external user scientists in the areas of ultrafast spectroscopy and optical microscopy

GARY WIEDERRECHT

Argonne National Laboratory - Chemistry Division
Chemist *1999-2006*
Assistant Chemist *1995-1999*

- Study of photochemical reactions in novel environments, such as liquid crystals and mesoporous materials
- Time-resolved spectroscopy and optical microscopy of photochemically active nanostructures

Argonne National Laboratory - Chemistry Division
Postdoctoral Fellow *1992-1995*

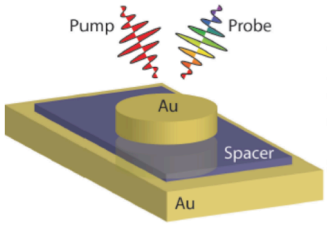
- Studies of biomimetic photoinduced charge transfer in solution and solid state
- Developed Ti:sapphire femtosecond laser system for ultrafast kinetic and spectral studies

Selected Publications

Selected from 120+ publications:

Ultrafast processes in hybrid nanostructures

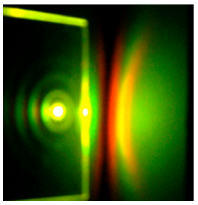
1. H. Harutyunyan*, A. B. F. Martinson, D. Rosenmann, L. K. Khorashad, L. V. Besteiro, A. O. Govorov*, **G. P. Wiederrecht***, *Anomalous ultrafast dynamics of hot plasmonic electrons in nanostructures with hot spots,* Nat. Nanotech. **10**, 770 (2015).
2. Z. Li, J. J. Foley, S. Peng, C.-J. Sun, Y. Ren, **G. P. Wiederrecht***, S. K. Gray*, Y. Sun*, *Reversible modulation of surface plasmons in gold nanoparticles enabled by surface redox chemistry,* Angew. Chem. **127**, 9076 (2015).
3. G. Zhu*, **G. P. Wiederrecht**, C. Ling, S. Wu, D. Banerjee, and K. Yano*, *Damping of coherent acoustic vibrations by nanosized pores in colloidal hypersonic crystals*, Appl. Phys. Lett. **105**, 051903 (2014).



4. G. A. Wurtz, R. Pollard, W. Hendren, **G. P. Wiederrecht,** D. J. Gosztola, V. A. Podolskiy, and A. V. Zayats*, *Designed ultrafast optical nonlinearity in a plasmonic nanorod metamaterial enhanced by nonlocality,* Nature Nanotech. **6**, 107 (2011).
5. **G. P. Wiederrecht***, J.E. Hall, and A. Bouhelier, *Control of Molecular Energy Redistribution Pathways via Surface Plasmon Gating,* Phys. Rev. Lett. **98**, 083001 (2007).
6. A. Bouhelier, R. Bachelot, G. Lerondel, S. Kostcheev, P. Royer, **G. P. Wiederrecht**, *Surface plasmon characteristics of tunable photoluminescence in single gold nanorods,* Phys. Rev. Lett. **95**, 267405 (2005).
7. **G. P. Wiederrecht***, G. A. Wurtz, J. Hranisavljevic, *Coherent coupling of molecular excitons to electronic polarizations of noble metal nanoparticles,* Nano Letters **4**, 2121-25 (2004).

Solar energy conversion, concentration, and light harvesting

8. M. C. So, **G. P. Wiederrecht,** J. E. Mondloch, J. T. Hupp*, O. K. Farha*, *Metal-organic framework materials for light-harvesting and energy transfer*, Chem. Comm. **51**, 3501 (2015).

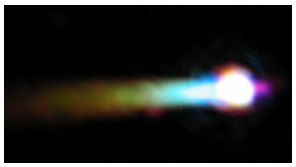


9. M. So, S. Jin, H.-J. Son, **G. P. Wiederrecht***, O. Farha*, J. T. Hupp*, *Layer-by-Layer Fabrication of Oriented Porous Thin Films Based on Porphyrin-Containing Metal-Organic Frameworks*, J. Am. Chem. Soc. **135**, 15698 (2013).
10. S. Jin, E. DeMarco, M. J. Pellin, O. K. Farha, **G. P. Wiederrecht***, and J. T. Hupp, *Distance-engineered plasmon-enhanced light harvesting in CdSe quantum dots*, J. Phys. Chem. Lett. **4**, 3527 (2013).
11. S. Jin, H.-J. Son, O.K. Farha*, **G.P. Wiederrecht***, J.T. Hupp*, *Energy transfer from quantum dots to metal-organic frameworks for enhanced light harvesting*, J. Am. Chem. Soc. **135**, 955 (2013).

12. H.-J. Son, S. Jin, S. Patwardhan, S. Wezenberg, N.C. Jeong, M. So, C. Wilmer, A. Sarjeant, G. Schatz, R. Snurr, O. Farha*, **G. P. Wiederrecht***, J. Hupp*, *Light Harvesting and Ultrafast Energy Migration in Porphyrin-Based Metal-Organic Frameworks,* J. Am. Chem. Soc. **135**, 862 (2013).
13. S. Jin, J. Zhang, R. D. Schaller, T. Rajh*, **G. P. Wiederrecht***, *Ultrafast charge separation from highly reductive ZnTe/CdSe type II quantum dots*, J. Phys. Chem. Lett. **3**, 2052 (2012).
14. **G. P. Wiederrecht***, N. C. Giebink*, J. Hranisavljevic, D. Rosenmann, A.B.F. Martinson, R. D. Schaller, and M. R. Wasielewski, *Visualizing charge movement near organic heterostructures with ultrafast time resolution via an induced Stark shift,* Appl. Phys. Lett. **100**, 113304 (2012).
15. S. Jin, A. B. F. Martinson*, and **G. P. Wiederrecht***, *Reduced Heterogeneity of Electron Transfer into Polycrystalline TiO_2 Films: Site-Specific Kinetics Revealed by Single Particle Spectroscopy,* J. Phys. Chem. C **116**, 3097 (2012).
16. N. C. Giebink*, **G. P. Wiederrecht**, and M. R. Wasielewski, *Resonance-shifting to circumvent reabsorption loss in luminescent solar concentrators*, Nature Photon. **5**, 694 (2011).

Optical devices, applications, and imaging

17. J. Plain, **G. P. Wiederrecht**, S. K. Gray, P. Royer, and R. Bachelot*, *Multiscale optical imaging of complex fields based on the use of azobenzene nanomotors*, J. Phys. Chem. Lett. **4**, 2124 (2013). (Perspective)
18. C. Huang, A. Bouhelier*, J. Berthelot, G. Colas-des Francs, J.-C. Weeber, A. Dereux, S. Kostcheev, A.-L. Baudrion, J. Plain, R. Bachelot, P. Royer, and **G. P. Wiederrecht**, *External control of the scattering properties of a single optical antenna,* Appl. Phys. Lett. **96**, 143116 (2010).



19. J. Zaumseil*, X. Ho, J. R. Guest, **G. P. Wiederrecht**, and J. A. Rogers, *Electroluminescence from electrolyte-gated carbon nanotube field-effect transistors,* ACS Nano **3**, 2225 (2009).
20. Y. G. Sun* and **G. P. Wiederrecht**, *Surfactantless synthesis of silver nanoparticles with rough surfaces and their applications in SERS,* Small **3**, 1964 (2007). (cover article)
21. A. Bouhelier*, F. Ignatovich, A. Bruyant, C. Huang, G. Colas des Francs, J.-C. Weeber, A. Dereux, **G. P. Wiederrecht,** and L. Novotny, *Surface plasmon interference excited by tightly focused laser beams*, Opt. Lett. **32***, 2535* (2007).
22. S. Jeon, V. Malyarchuk, J. A. Rogers*, **G. P. Wiederrecht**, *Three dimensional nanofabrication by two photon lithography in a single exposure step*, Opt. Express. **14**, 2300-8 (2006).
23. A. Bouhelier*, **G. P. Wiederrecht***, *Surface plasmon rainbow jets*, Opt. Lett. **30**, 884 (2005).
24. **G. P. Wiederrecht**, *Near-field imaging of metal nanoparticles*, Eur. Phys. J. Appl. Phys. **28***,* 3-18 (2004). (Invited article)

Patents

- No. 8,922,094 *Microelectromechanical (MEMS) manipulators for control of nanoparticle coupling interactions*, O. D. Lopez, G. P. Wiederrecht, D. J. Gosztola, D. C. Mancini.
- No. 8,841,548 *Resonance-shifting luminescent solar concentrator*, N.C. Giebink, G.P. Wiederrecht, M. R. Wasielewski.
- No. 7,333,205 *Broadband surface plasmon jets: direct observation of plasmon propagation with application to sensors and optical communications in microscale and nanoscale circuitry*, A. Bouhelier, G. P. Wiederrecht.
- No. 7,251,040 *Single metal nanoparticle scattering interferometer*, S.-K. Eah, X.-M. Lin, G. P. Wiederrecht.