

## Ilia N. Ivanov

R&D Staff  
Functional Hybrid Nanostructures Group  
Center for Nanophase Materials Sciences  
Oak Ridge National Laboratory  
(865) 771-6213  
[ivanovin@ornl.gov](mailto:ivanovin@ornl.gov)



---

### Education

Russian University of Chemical Technology	Radiation and Physical Chemistry	B.S., 1990
Russian University of Chemical Technology	Radiation and Physical Chemistry	M.S., 1988
Bowling Green State University	Photo and Physical Chemistry	Ph.D., 1993

### Professional Experience

2006–p	Research Staff Member, Functional Hybrid Nanostructures Group, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory (ORNL)
2009–p	Adjunct Professor, Dept. of Materials Sciences and Engineering, University of Tennessee-Knoxville
2002–2006	Research Associate, Dept. of Material Sciences and Technologies, University of Tennessee-Knoxville
1998–2001	Postdoctoral Research Associate, Chemical Sciences Division, ORNL
1990–1993	Assistant Director, Industrial Technologies and Materials, Moscow
1988–1993	Research Assistant, Department of Physical Chemistry (Radiation and Photochemistry), Russian University of Chemical Technology, Moscow

### Professional and Synergistic Activities

2011	Session Chair, “Fundamentals of Design for New Organic and Hybrid Nanostructured Materials for Photonic and Informational Technologies, Sensors, Conversion and Storage of Solar Energy,” Photonics of Organic and Hybrid Structures Conference, Chernogolovka, Russian Academy of Sciences, Sept. 7-9, 2011.
2011	Guest Editor, Journal of Nanomaterials ( <i>Special Issue</i> ), “Nanocrystals for Electronic and Optoelectronic Applications”
2008–p	Organizer, Nanomaterials Based Photovoltaics Workshop, ORNL
1999–p	Reviewer, <i>Nanotechnology</i> , <i>Applied Physics Letters</i> , <i>Small</i> , <i>Journal of Nanomaterials</i> , <i>Journal of Physical Chemistry</i>

### Patents:

- “Transparent Conductive Nano-Composites,” D. B. Geohegan, I. N. Ivanov, A. A. Puzetzkyy, S. Jesse, B. Hu, M. Garrett, B. Zhao, U.S. Patent 7,923,922 B2, Apr. 12, 2011.
- “Pulsed Thermal Method for Producing Thin Films and Films Produced Thereby,” C. E. Duty, C. J. C. Bennett, J.-W. Moon, T. J. Phelps, C. A. Blue, Q. Dai, M. Z. Hi, I. N. Ivanov, G. E. Jellison, Jr., L. J. Love, R. D. Ott, C. M. Parish, S. Walker, U.S. Patent Application 61/473,385, Filed Apr. 8, 2011.
- “Fermentative Method for Making Non-Oxide Fluorescent Nanoparticles,” T. J. Phelps, R. J. Lauf, J.-W. Moon, A. J. Rondinone, L. J. Love, C. E. Duty, A. S. Madden, Y. Li, I. N. Ivanov, C. J. Rawn, U.S. Patent Application 12/874,522, Released for CIP, Sept. 2, 2010.
- “Microbially-Mediated Method for Synthesis of Non-Oxide Semiconducting Nanoparticles,” T. J. Phelps, R. J. Lauf, J.-W. Moon, A. J. Rondinone, L. J. Love, C. E. Duty, A. S. Madden, Y. Li, I. N. Ivanov, C. J. Rawn, U.S. Patent Application 20100193752, Released for CIP, Aug. 5, 2010.
- “Fabrication of High Thermal Conductivity Arrays of Carbon Nanotubes and Their Composites,” D. B. Geohegan, I. N. Ivanov, A. A. Puzetzkyy, U.S. Patent 7,763,353 B2, Jul. 27, 2010.
- “Doped Carbon Nanostructure Field Emitter Arrays for Infrared Imaging,” K. Korsah, L. R. Baylor, J. B. Caughman, R. A. Kisner, P. D. Rack, I. N. Ivanov, U.S. Patent 7,608,824, Oct. 27, 2009.
- “Fermentative Method for Making Non-Oxide Fluorescent Nanoparticles,” T. J. Phelps, R. J. Lauf, J.-W. Moon, A. J. Rondinone, L. J. Love, C. E. Duty, A. S. Madden, Y. Li, I. N. Ivanov, C. J. Rawn, U.S. Patent Application 12/364,638, Filed Feb. 3, 2009.

### **Invited Presentations**

- “0D- 1D and 3D Assemblies of Nanomaterials for Transparent Conductive Electrodes,” (*Tutorial Lecture*) Giga and Nano Challenges in Electronics, Photonics and Renewable Energy Conference, Moscow, Russia, Sept. 9-16, 2011.
- “Nano-Material Based Transparent Conductive Coatings” 2011 MRS Spring Meeting, San Francisco, CA, Apr. 25-29, 2011.
- “Nanomaterials Based Organic Photovoltaics” 3rd Workshop on “Sustainable Energy Future: Focus on Organic Photovoltaics” 2010 User Meeting for Center for Nanophase Materials Sciences, ORNL, Oak Ridge, TN, Sept. 13-17, 2010.
- “Multi-Functional Nanomaterial Composites,” 2nd Workshop on “Sustainable Energy Future: Focus on Organic Photovoltaics,” 2009 Joint CNMS-SHaRE User Meeting, Center for Nanophase Materials Sciences, ORNL, Oak Ridge, TN, Sept. 16-17, 2009.
- “Nanomaterials for Sustainable Energy Future” LUX Executive Summit, Boston, MA, Oct. 20-21, 2008.
- “Nanomaterials in Energy Related Applications: Improving the Efficiency of OPV and OLED with Carbon Nanotubes,” Eighth World Congress on Nanocomposites, San Diego, CA, Sept. 15-17, 2008.
- “Nanomaterials Based Organic Photovoltaics,” 1st Workshop on “Sustainable Energy Future: Focus on Organic Photovoltaics,” Oak Ridge National Laboratory, Oak Ridge, TN, Sept. 10, 2008.
- “Multifunctional Nanocomposites: Carbon Nanomaterials for Energy Applications,” Photoscience Group of the Institute for Organic, Chemistry and Photo Reactivity, National Research Council of Italy ISOF/NRC Bologna, Italy, Jun. 4, 2008.
- “Electro-Optical Functionality of Carbon Nanotubes,” Georgia Institute of Technology, Materials Science and Engineering, Atlanta, GA, Apr. 11, 2008.
- “Nanomaterials for Multifunctional Prosthetics,” Martin Bionics, Oklahoma City, OK, Sept. 5-6, 2006.
- “Carbon Nanotube Composites,” Motorola Labs Workshop on Nanotechnology Productization Status and Trends” Tempe, AR, May 23, 2006.
- “Multi-Functional Carbon Nanotube Composites,” Conductivity of Nano Polymers & Composites Workshop, Seattle, WA, Mar. 13-16, 2006.
- “Multi-Functionality of Carbon Nanotubes: Mechanical and Electro-Optical Applications,” Department of Materials Sciences and Engineering, University of Tennessee-Knoxville, Sept. 2005
- “Advanced Synthesis and Processing of Multifunctional Nanotube Composites,” 2<sup>nd</sup> U.S.-Korea Workshop on Nanoelectronics and 4th US-Korea Workshop on Nanostructured Materials and Nanomanufacturing, Korea Institute of Science & Technology, Seoul, Korea, Apr. 25-26, 2005.

### **Research Synopsis:**

*Electro-optical functionality of nanomaterials and nanomaterial-enhanced composites. Nanomaterials of interest include 0D-1D and 3D assemblies of organic (carbon nanotubes, graphene) and inorganic (including oxides) structures.* Current research interest is the area of basic and applied research of synthetic multifunctional materials, where within one structure multiple performance objectives could be accomplished. These materials are designed to mimic multifunctionality of natural materials, and based on nano-structures, like carbon nanotubes, which have unique mechanical, thermal and electrical properties. The goal is to translate these unique properties of nanostructures from the nanoscale of nanomaterial to the macroscale of multifunctional composite materials, which should show better power generation, sensing, self-health monitoring and self-repair properties along with the improvement of structural, thermal functionalities. An approach chosen is to develop fundamental knowledge and understanding of interfacial phenomena, where the interplay between the properties of nano- and the bulk material of the composites takes place.

**Collaborations:** M. Dadmun (Univ. of TN-Knoxville); R. Gerhardt (Georgia Technology Univ.); B. Hu (Univ. of TN-Knoxville); A. V. Melechko (North Carolina State Univ.); Z. Pan (Univ. of Georgia); D. R. Strachan (Univ. of KY); A. Voevodin (AFRL)

### **Graduate and Postdoctoral Advisors and Advisees:**

Graduate Advisor: Dr. Michael A. J. Rodgers (Bowling Green State University)  
Post Graduate Advisors: Dr. David Geoghegan and Dr. Reza Dabestani (Oak Ridge National Laboratory)

### **Graduate and Postgraduate Advisees:**

Graduate: C. J. Capozzi (Georgia Inst. of Technology), S. Joshi (Georgia Inst. of Technology)  
Postdoctoral: S. Back (AFRL, Univ. of Ohio-Dayton), M. Garrett (Wu Han National Laboratory for Optoelectronics, Huazhong Univ. of Sci. and Tech.), X. Xu (Univ. of TN-Knoxville)

## PUBLICATIONS

**Iliia N. Ivanov**

Center for Nanophase Materials Sciences Division  
Oak Ridge National Laboratory  
Oak Ridge, TN 37831  
[ivanovin@ornl.gov](mailto:ivanovin@ornl.gov)

### **Recent Book Chapters**

- “Carbon Nanotube Assemblies for Transparent Conductive Coatings,” Iliia N. Ivanov, Matthew P. Garrett, R. Gerhardt, Springer Series in Materials Science (submitted, Dec.2011)
- “Laser Interactions in Nanomaterials Synthesis,” D. B. Geohegan, A. A. Poretzky, C. M. Rouleau, J. J. Jackson, G. Eres, Z. Liu, D. Styers-Barnett, H. Hu, B. Zhao, K. Xiao, I. Ivanov, K. More, Chapter 1 in Laser-Surface Interactions for New Materials Production: Tailoring Structure and Properties, Springer Series in Materials Science, Vol. 130, Eds., A. Miotello and P. Ossi, Springer-Verlag, Berlin Heidelberg, Germany (2010).

### **Refereed Journal Papers (Journals with Impact Factor>4\*):**

- D. P. Hunley, S. L. Johnson, J. K. Stieha, A. Sundararajan, A. T. Meacham, I. N. Ivanov, D. R. Strachan, “Crystallographically Aligned Carbon Nanotubes Grown on Few-Layer Graphene Films” *ACS Nano* **5**(8), 6403 (2011).\*
- L. Luo, C. Wilhelm, C. N. Young, C. P. Grey, G. P. Halada, K. Xiao, I. N. Ivanov, J. W. Howe, D. B. Geohegan, N. S. Goroff, “Characterization and Carbonization of Highly Oriented Poly(diiododiacetylene) Nanofibers” *Macromolecules* **44**(8), 2626 (2011).\*
- R. J. Patel, T. B. Tighe, I. N. Ivanov, M. A. Hickner, “Electro-Optical Properties of Electropolymerized Poly(3-hexylthiophene)/carbon Nanotube Composite Thin Films,” *Journal of Polymer Science Part B: Polymer Physics* **49**, 1269 (2011).
- M. Shao, M. Garrett, I. N. Ivanov, B. Hu, “Effects of Single Walled Carbon Nanotubes on the Electroluminescent Performance of Organic Light-Emitting Diodes,” *Organic Electronics* **12** (6), 1098 (2011).
- M. Shao, L. Yan, H. Pan, I. Ivanov, B. Hu, “Giant Magnetic Field Effects on Electroluminescence in Electrochemical Cells,” *Advanced Materials* **23**(19), 2216 (2011).\*
- Z. Sun, K. Xiao, J. K. Keum, X. Yu, K. Hong, I. Ivanov, J. Chen, D. Li, B. Sumpter, A. Payzant, C. Rouleau, D. B. Geohegan, “PS-b-P3HT Copolymers as P3HT/PCBM Interfacial Compatibilizers for High Efficiency Photovoltaics,” *Advanced Materials* **23**, 5529 (2011).\*
- I. Vlasiouk, S. Smirnov, I. N. Ivanov, P. F. Fulvio, S. Dai, H. Meyer, M. Chi, D. Hensley, P. Datskos, N. V. Lavrik “Electrical and Thermal Conductivity of Low Temperature CVD Graphene: The Effect of Disorder” *Nanotechnology* **22**, 275716 (2011).
- Z. Wu, A. J. Rondinone, I. N. Ivanov, S. H. Overbury, “Structure of Vanadium Oxide Supported on Ceria by Multiwavelength Raman Spectroscopy,” *Journal of Physical Chemistry C* **115**(51), 25368 (2011).\*
- X. Xu, K. Seal, X. Xu, I. N. Ivanov, C.-H. Hsueh, N. A. Hatab, L. Yin, X. Zhang, Z. Cheng, B. Gu, Z. Zhang, J. Shen, “High Tunability of the Surface-Enhanced Raman Scattering Response with a Metal-Multiferroic Composite,” *Nano Letters* **11**(3), 1265 (2011).\*
- T. R. Hendricks, I. N. Ivanov, D. A. Schaeffer, P. A. Menchhofer, J. T. Simpson, “Processing of Loose Carbon Nanotubes into Isolated, High-Density Submicron Channels,” *Nanotechnology* **21**(11), 115301 (2010).
- D. Linton, P. Driva, B. Sumpter, I. N. Ivanov, D. Geohegan, C. Feigerle, M. D. Dadmun, “The Importance of Chain Connectivity in the Formation of Non-covalent Interactions Between Polymers and Single-Walled Carbon Nanotubes and its Impact on Dispersion,” *Soft Matter* **6**(12), 2801 (2010).\*
- M. A. Schreuder, K. Xiao, I. N. Ivanov, S. M. Weiss, S. J. Rosenthal, “White Light-Emitting Diodes Based on Ultrasmall CdSe Nanocrystal Electroluminescence,” *Nano Letters* **10**(2), 573 (2010).\*

- A. Teslev, E. Strelcov, I. A. Luk'yanchuk, J. D. Budai, J. Z. Tischler, I. N. Ivanov, K. Jones, R. Proksch, S. V. Kalinin, A. Kolmakov A. "Interplay Between Ferroelastic and Metal-Insulator Phase Transitions in Strained Quasi-Two-Dimensional VO<sub>2</sub> Nanoplatelets," *Nano Letters* **10**(6), 2003 (2010).\*
- H. Zang, I. N. Ivanov, B. Hu, "Magnetic Studies of Photovoltaic Processes in Organic Solar Cells," *IEEE Journal of Selected Topics in Quantum Electronics* **16**(6), 1801 (2010).
- J. Park, S. Kwon, S. I. Jun et al., "Stress Induced Crystallization of Hydrogenated Amorphous Silicon," *Thin Solid Films* **517**(11), 3222 (2009).
- A. A. Puztzyk, G. Eres, C. M. Rouleau, I. N. Ivanov, D. B. Geohegan, "Real-Time Imaging of Vertically Aligned Carbon Nanotube Array Growth Kinetics," *Nanotechnology* **19**(5), 055605, (2008).
- B. Zhao, I. N. Ivanov, D. B. Geohegan, "Cumulative and Continuous Laser Vaporization Synthesis of Single Wall Carbon Nanotubes and Nanohorns," B. Zhao, I. N. Ivanov, D. B. Geohegan, *Applied Physics a-Materials Science & Processing* **93**(4), 849 (2008).
- S. Agnihotri, Y. Zheng, J. P. B. Mota, I. N. Ivanov, and P. Kim, "Practical Modeling of Heterogeneous Bundles of Single-Walled Carbon Nanotubes for Adsorption Applications: Estimating the Fraction of Open-Ended Nanotubes in Samples," *Journal of Physical Chemistry C* **111**(37), 13747 (2007).\*
- K. Xiao, J. Tao, Z. W. Pan, A. A. Puztzyk, I. N. Ivanov, S. J. Pennycook, D. B. Geohegan, "Single-Crystal Organic Nanowires of Copper-Tetracyanoquinodimethane: Synthesis, Patterning, Characterization, and Device Applications," *Angewandte Chemie International Edition* **46**(15), 2650 (2007).\*
- I. N. Ivanov, F. A. Reboledo, "Towards Gaining Control of Nanoscale Components and Organization of Organic Photovoltaic Cells: Optimizing the Interface for Mesoscale- Three Dimensional Devices," Productive Nanosystems – A Technology Roadmap Workshop, Foresight Nanotechnology Roadmap Working Group Proceedings **36**, 36-1 (2007).
- S. Jesse, M. A. Guillorn, I. N. Ivanov, A. A. Puztzyk, J. Y. Howe, P. F. Britt, D. B. Geohegan, "In Situ Electric-Field-Induced Contrast Imaging of Electronic Transport Pathways in Nanotube-Polymer Composites," *Applied Physical Letters* **89**, 13114 (2006).
- A. Rasheed, M. D. Dadmun, I. Ivanov, P. F. Britt, D. B. Geohegan, "Improving Dispersion of Single-Walled Carbon Nanotubes in a Polymer Matrix Using Specific Interactions," *Chemistry of Materials* **18**, 3513 (2006).\*
- M. J. Lance, C.-H. Hsueh, I. N. Ivanov, and D. B. Geohegan, "Reorientation of Carbon Nanotubes in Polymer Matrix Composites Using Compressive Loading," *Journal of Materials Research* **20**(4), 1026 (2005).\*
- G. Cheng, X. Z. Peng, G. L. Hao, V. O. Kennedy, I. N. Ivanov, K. Knappenberger, T. J. Hill, M. A. J. Rodgers, M. E. Kenney, "Synthesis, Photochemistry, and Electrochemistry of a Series of Phthalocyanines with Graded Steric Hindrance," *Journal of Physical Chemistry A* **107**(18), 3503 (2003).\*
- M. E. Sigman, S. Read, J. T. Barbas, I. Ivanov, E. W. Hagmann, A. C. Buchanan, R. Dabestani, M. K. Kidder, P. F. Britt, "Rapid Molecular Motion of Pyrene and Benzene Moieties Covalently Attached to Silica Surfaces," *Journal of Physical Chemistry A* **107**(18), 3450 (2003).\*
- I. N. Ivanov, R. Dabestani, A. C. Buchanan, M. E. Sigman, "Fluorescence Decay Study of Anisotropic Rotations of Substituted Pyrenes Physisorbed and Chemically Attached to a Fumed Silica Surface," *Journal of Physical Chemistry B* **105**(42), 10308 (2001).\*
- R. Dabestani, J. Higgin, D. Stephenson, I. N. Ivanov, M. E. Sigman, "Photophysical and Photochemical Processes of 2-methyl, 2-ethyl, and 2-tert-butylanthracenes on Silica Gel: A Substituent Effect Study," *Journal of Physical Chemistry B* **104**(44), 10235 (2000).\*
- C. A. Reyes, M. Medina, C. Crespo-Hernandez, M. Z. Cedeno, R. Arce, O. Rosario, D. M. Steffenson, I. N. Ivanov, M. E. Sigman, R. Dabestani, "Photochemistry of Pyrene on Un-activated and Activated Silica Surfaces," *Environmental Science & Technology* **34**(3), 415 (2000).
- R. Dabestani, I. N. Ivanov, "A Compilation of Physical, Spectroscopic and Photophysical Properties of Polycyclic Aromatic Hydrocarbons," *Photochemistry and Photobiology* **70**(1), 10 (1999).
- S. P. Polevoi, A. E. Khachaturov-Tavrizyan, I. N. Ivanov, M. V. Vladimirova, I. A. Kulikov, "Mechanism of Radiation-Thermal Decomposition of Concentrated Sulfuric-Acid," *High Energy Chemistry* **23**(3), 178 (1989).\*