Prahlad Kumar Routh *PhD Candidate*

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Education

Stony Brook University — Stony Brook, NY

Doctor of Philosophy, Materials Science & Engineering — 2010 - 2016

Dissertation Title: Water based self-assembly of conjugated polymer/nanocomposite thin films: Controlling morphology and optical properties

Advisor: Dr. Mircea Cotlet, Scientist, Brookhaven National Laboratory (BNL)

Co-Advisor: Dr. T. Venkatesh, Associate Prof., Stony Brook University

Master of Science, Materials Science & Engineering, GPA: 3.93/4.0 — 2010 - 2013

Indian Institute of Technology Madras (IIT Madras) — Chennai, India

Bachelor of Technology, Metallurgical & Materials Engineering, GPA: 8.1/10 — 2005 - 2009

Minor: Chemistry

Advisor: Dr. Ashutosh S. Gandhi, Associate Prof., IIT Madras

Employment History

Research Assistant, Advanced Optical Spectroscopy and Microscopy Laboratory, BNL — 2011 - 2016

Teaching Assistant, College of Engineering and Science, Stony Brook University — 2010 - 2013

Senior Research Fellow, Industrial Consultancy & Sponsored Research, IIT Madras — 2009 - 2010

Publications

Peer-Reviewed Publications

- H. Zang*, *Prahlad K. Routh**, Yuan Huang*, Jia-Shiang Chen, Eli Sutter, Peter Sutter and Mircea Cotlet, Non-radiative Energy Transfer from Individual CdSe/ZnS Quantum Dots to Single-Layer and Few-Layer Tin Disulfide, ***ACS Nano,* 2016** **Equal Contribution of Authors*
- *Prahlad K. Routh*, D. Nykypanchuk, T.A. Venkatesh, M. Cotlet, Long Range Self-assembly of Polythiophene Breath Figures: Optical and Morphological Characterization, ***Adv. Funct. Mater.*, 2015** **Highlighted as cover paper.**
- Y. Park*, Z. Liu*, *Prahlad K. Routh**, C. Kuo, Y. Park, H. Tsai, J. Martinez, A. Shreve, M. Cotlet, and Hsing-Lin Wang, DNA-assisted photoinduced charge transfer between a cationic poly (phenylene vinylene) and a cationic fullerene, ***Phys. Chem. Chem. Phys., 2015*** **Equal Contribution of Authors*
- H. Zang, *Prahlad K. Routh*, R. Alam, M. Maye and M. Cotlet, Core size dependent hole transfer from a photo-excited CdSe/ZnS quantum dot to a conductive polymer, ***Chem. Commun.*, 2014** **Highlighted as cover paper.**

Manuscripts in Submission

- H. Zang*, *Prahlad K. Routh**, Q. Meng, M. Cotlet, Charge transfer assisted near infrared blinking emission from isolated lead sulfide/cadmium sulfide nanocrystals, ***Under Review,* 2016** **Equal Contribution of Authors*
- Haiqing Liu, Jinkyu Han, Coray Mcbean, Crystal S. Lewis, *Prahlad Kumar Routh*, Mircea Cotlet, and Stanislaus S. Wong, Synthesis-driven enhanced up-conversion luminescence and morphology-dependent energy transfer behavior in novel phase-tunable NaYF4:Yb,Er-based nanoscale motifs, ***Under Review,* 2016**

Manuscripts in Preparation

- Jia-Shiang Chen, *Prahlad K. Routh*, H. Zang, Mircea Cotlet, Energy Transfer from Individual Perovskites to Single Layer Graphene, ***Under Preparation,*** **2016**
- M. Dao, *Prahlad K. Routh*, T. Venkatesh, Nano-fretting of nano-twinned Copper, ***Under Preparation,*** **2016**

Awards & Honors

- Graduate Research Assistantship, Stony Brook University, Stony Brook, NY 2011-16
- Full tuition scholarship, Stony Brook University, Stony Brook, NY 2010-16
- Best Poster Award, Advanced Energy Conference (AEC), Albany, NY 2014
- Graduate Student Association Travel Award, Stony Brook University, Stony Brook, NY 2013
- Research Foundation Seed Grant, Stony Brook University, Stony Brook, NY 2011
- Graduate Teaching Assistantship, Stony Brook University, Stony Brook, NY 2010-11

Conference Participation

Paper Presentations

- *Prahlad K. Routh*, T.A. Venkatesh, M. Cotlet, *Oral Presentation:* Self-assembled Breath Figures arrays of conjugated conducting polymers for photovoltaic applications, American Chemical Society, March **2014.**
- *Prahlad K. Routh*, N. Reddy, K.C. Harikumar, A. Gandhi, *Oral Presentation:* Molten salt attack on Zirconia based thermal barrier coatings, International Symposium on Emerging Challenges for Metals and Materials: Engineering and Technology, 63rd Annual Technical Meet of the Indian Institute of Metals, November **2009.**

Poster Presentations

- *Prahlad K. Routh*, Dmytro Nykypanchuk, T.A. Venkatesh, M. Cotlet, Optical and morphological characterization of large area polythiophene breath figures, Materials Research Society, December **2015**, Boston, MA.
- *Prahlad K. Routh*, T.A. Venkatesh, M. Cotlet, Patterning of Conjugated Polymer Thin Films by water based self assembly, Nanoscience NY, CUNY ASRC, June **2015**, New York City, NY
- *Prahlad K. Routh*, T.A. Venkatesh, M. Cotlet, Patterning of Conjugated Polymer Thin Films by water based self assembly, Materials Research Society, December **2014**, Boston, MA
- *Prahlad K. Routh*, T.A. Venkatesh, M. Cotlet, Ordered Microporous Breath Figures from Regio-Regular Polythiophenes, NSLS-CFN User Meeting, May **2014,** Upton, NY
- **Best Poster Award:** *Prahlad K. Routh*, T.A. Venkatesh, M. Cotlet, Ordered Microporous Breath Figures from Regio-Regular Polythiophenes, Advanced Energy Conference, April **2014,** Albany, NY

Research Experience

Brookhaven National Laboratory (BNL), Center for Functional Nanomaterials Upton, NY

PhD Candidate, (affiliated with Stony Brook University) 2011 - Present

- Developed a novel and cost-effective self-assembly patterning technique with 150% higher surface area and optimized the process for potential applications in sensors and Building Integrated PVs.
- Conducted time-resolved single particle spectroscopy and ultra-sensitive nanoscale optical imaging (UV, Vis and NIR) of polymers and nanomaterials.
- Investigated charge/energy transfer dynamics between semiconducting nanocrystals (QDs) and polymers as well as 2-D materials such as SnS_2 for energy harvesting applications using ultrafast lasers and fluorescence based spectroscopy and microscopy techniques.
- Investigated the upconversion optical properties of rare-earth halide nanocrystals and its composites with conjugated polymers

- Explored the DNA-assisted self-assembly of water soluble (environmental friendly) conducting polymer and C_{60}.
- Supported Advanced Optical Spectroscopy and Microscopy User Facility

National Institute of Standards & Technology (NIST) Gaithersburg, MD
User, NIST Center for Neutron Research 2014

- Collaborated with scientists at NIST to conduct Small Angle Neutron Scattering (SANS) study of polymer chain aggregation in polythiophene derivatives to understand the dynamics of Breath Figure Technique.

Indian Institute of Technology Madras Chennai, India
Senior Research Fellow, Industrial Consultancy & Sponsored Research 2009 - 2010

- Developed a thermodynamic model of molten salt attack on Yttria Stabilized Zirconia (YSZ) ceramic using ThermoCalc and FACTSAGE packages to evaluate thermodynamic and kinetic stability of different phases at higher temperatures.
- Project was sponsored by Naval Research Board, India focusing on increasing the efficiency of thermal barrier coatings used in gas turbines and jet engines by increasing the operating temperature.

Undergraduate Researcher, Metallurgical and Materials Engineering 2008 - 2009

- Synthesized and investigated high temperature processing of nano-crystalline YSZ ceramic for phase stability.
- Designed an experiment to propose the reaction mechanism and presented the results at Leading National Conference: Annual Technical Meeting of Indian Institute of Metals 2009.

National Aerospace Laboratories Bangalore, India
Summer Intern, Materials Science Division 2007

- Studied the processing of Ni-Ti based Shape Memory Alloy in a wire form and its electrical property characterization.

Teaching Experience

Stony Brook University Stony Brook, NY
Teaching Fellow, College of Engineering and Science 2010 - 2013

- Led weekly office hours and recitation classes for helping $\sim$ 30 students with problem solving and open discussions.
- 6 semesters of experience in assisting for teaching undergraduate courses: Engineering Design (Fall 2010, 11, 12); Strength of Materials (Spring 2012 and 13); Electronic Materials (Spring 2011).

The New York Academy of Science New York, NY
Scientist Consultant, Scientist-In-Residence Program Dec 2015 - Present

- Partnered with New York City public school to develop and implement rigorous, inquiry-based science learning programs for high school students.
- Planned and supervised 6 month long science project and conducted weekly joint classes and to increase students' exposure to hands-on science, STEM professionals, and STEM career pathways.

Consulting Experience

PreScouter, Inc. Evanston, IL
Scholar Consultant, Global Scholars Program April 2015 - Present

- Delivered multiple projects in collaboration with team of 4 - 5 PhDs to help shape client's technology roadmap and form strategic partnership by providing market feasibility report on emerging technology and potential solutions.
- Bi-weekly meeting with international clients to evaluate and gain feedback on the proposed solutions to find the best fit with company's requirements.

Advanced Laboratory Skills

Optical and Opto-Electronic Characterization:

- Single Molecule Spectroscopy
- Confocal Fluorescence Microscopy (UV, Vis, NIR)
- Confocal Raman Microscopy and Spectroscopy
- Non Linear Optical Microscopy: SHG, Two-Photon
- PL Lifetime based Techniques: FLIM, FRET, FCS
- Time and Spectrally Resolved Microscopy
- Pico and femto-second Class-4 laser optics
- UV-Visible Absorption and Emission Spectroscopy
- Fluorescent Probes for Optical Microscopy

Advanced Analytical Laboratory Tools:

- X-Ray Diffraction (XRD)
- X-ray Scattering (GISAXS/SAXS/WAXS)
- Electron Microscopy (SEM, TEM, EDS)
- Neutron Scattering (SANS)
- Surface Characterization: AFM, Ellipsometry
- High temperature processing of ceramics
- Other: FTIR, DSC, TGA

Development and Characterization of Organic and Hybrid Photovoltaics:

- Semiconductor Processing: Wet etching, Reactive Ion Etching
- Polymer, Nanoparticle and Polymer Nanocomposites Processing
- Photovoltaic device: Designing, Fabrication and Electrical characterization
- Thin Film Deposition: PVD (Thermal Evaporation, Sputtering); CVD: Atomic Layer Deposition.

Advanced Computational Skills

- Statistical Analysis: Design of Experiment and ANOVA: R, JMP
- Data analysis, fitting and statistics using various kinetic models: Matlab, Origin Pro and Igor Pro
- Image processing and quantitative analysis using ImageJ, Matlab and Python
- Thermodynamic Modeling with CALPHAD approach using Thermocalc and FACTSAGE packages.
- Modeling and analysis of picosecond time correlated single photon counting (TCSPC) data
- Probability and Statistics: Experience with Maximum Likelihood Estimation, Maximum Entropy Models, Poisson and Gaussian Distributions, Time-series Analysis
- Familiar with various Machine Learning Algorithms
- Other Programming and Scripting Skills: C/C++, Linux, LaTeX

Professional Affiliations

- Materials Research Society 2014 - Present
- American Chemical Society 2014 - Present
- New York Academy of Sciences 2013 - Present

Extra-Curricular Activities

- Long-distance road biking
- Landscape photography
- Weight-lifting: Bronze Medal (College Level)

Service

The New York Academy of Science — New York, NY

Mentor, The Junior Academy - Global STEM Alliance — Feb 2016 - Present

- Virtual mentoring of exceptional young students of age group 13-19 interested in STEM from around the world.
- Guiding them complete a 60-day global challenge in solving real world problem of reducing food waste.

Brookhaven National Laboratory (BNL) — Upton, NY

Organizer, Young Researcher Symposium (YRS) — 2013

- Guided the communication department in drafting the formal invitation letter for over 50 invited guests.
- Provided a platform for constructive interaction between leading researchers and students & post-docs.

Judge, Science Fair — 2012 - 2013

- Member of Judging team which evaluated the displayed works of high schools and elementary school students and chose the finalists to take part in National Level Science Fair.

Indian Institute of Technology Madras — Chennai, India

Administrator, Department Computing Facility — 2008 - 2009

- Led the team responsible for setting up and maintaining a new computing facility.
- Started and administered online forum using Drupal to increase student-faculty interaction.
- Maintained web operations for department technical festival - Amalgam 2008.

Organizer & Quiz Master, Multiple Quiz Contests — 2007-2008

- Conducted a Science Bowl (Brahm Prakash Memorial Materials Quiz) for high school students of Chennai, India for national selection.
- Organized quiz contests for International Conference and Department Technical Festival attendees at IIT Madras.