

## Curriculum Vitae

<p><b>NAME</b></p> <p style="text-align: center;"><b>Amit K Naskar</b></p> <p><b>Phone:</b> 865-576-0309 (work); 864-650-1406 (cell)</p> <p><b>Fax:</b> 865-574-8257</p> <p><b>Email:</b> naskarak@ornl.gov anaskar@utk.edu aknaskar@gmail.com</p>	<p><b>POSITION TITLE</b></p> <p><b>Group Leader and Senior R&amp;D Staff Carbon and Composites, Materials Science and Technology Division Oak Ridge National Laboratory Oak Ridge TN 37831-6053</b></p> <p><b>Joint Faculty Member, The Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville, TN 37996-3394</b></p> <p><b>Joint Faculty Member, Center for Renewable Carbon, The University of Tennessee Institute of Agriculture, Knoxville, TN 37996</b></p>
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### Education/Training

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Calcutta University, Calcutta, India	B.Sc.	1993	Chemistry (Honors)
Devi Ahilya University, Indore, India	Master of Science	1996	Physical Chemistry
Indian Institute of Technology, New Delhi, India	Master of Technology	1998	Fiber Science and Technology
Indian Institute of Technology, Kharagpur, India	Ph.D.	2003	Rubber Technology
Clemson University, Center for Advanced Engineering Fibers and Films, Department of Chemical & Bio-molecular Engineering, Clemson, South Carolina	Postdoctoral Fellow	2002-2006	Polymer Engineering
Oak Ridge National Laboratory, Oak Ridge, Tennessee	Postdoctoral Fellow	2006-2008	Carbon Fibers & Polymer Composites

### A. Positions, Honors, and Professional History

#### Positions and Employment

2015 – Present	Joint Faculty Member, Center for Renewable Carbon, The University of Tennessee Institute of Agriculture, Knoxville, TN 37996
2014 – Present	Joint faculty member, University of Tennessee Knoxville – Oak Ridge National Laboratory Bredesen Center for Interdisciplinary Research and Graduate Education.
2013 – Present	Group Leader, Carbon and Composites Group, Oak Ridge National Laboratory, Oak Ridge, TN
2013 – Present	Senior R&D Staff, Oak Ridge National Laboratory, Oak Ridge, TN
2011 – 2013	R&D Staff, Oak Ridge National Laboratory, Oak Ridge, TN
2008 – 2011	R&D Associate, Oak Ridge National Laboratory, Oak Ridge, TN
2006 – 2008	Post-Doctoral Fellow, Oak Ridge National Laboratory, Oak Ridge, TN

- 2002 – 2006 Post-Doctoral Researcher, NSF Center for Advanced Engineering Fibers and Films (CAEFF), Clemson University, Clemson, SC
- 2001 – 2002 Research Assistant, Department of Chemical and Biochemical Engineering, University of Western Ontario, ON, Canada
- 1998 – 2001 Senior Research Fellow and Doctoral Student, Rubber Technology Centre, Indian Institute of Technology, Kharagpur, India
- 1997 – 1998 Production Engineer, Microsynth Fabrics (India) Limited, Silvassa, India
- 1996 – 1997 Graduate Student (M.Tech.), Department of Textile Technology, Indian Institute of Technology (IIT), New Delhi, India
- 1994 – 1996 Graduate Student (M.Sc.), Devi Ahilya University, Indore, India
- 1994 Production Chemist, Nicholas Piramal Limited, Indore, India
- 1993 – 1994 Laboratory Chemist, Rama Phosphates Limited, Indore, India

### **Honors & Professional Accomplishments**

- 2015 ORNL Science & Technology Partnerships Award for five successful Technology Transfer (Licenses) to (A) PMC, LLC, (B) TennEra, LLC, (C) Strangpresse, LLC, (D) FWD: Energy, Inc., (E) RJ Lee Group, Inc.
- 2015 Journal inside front cover publication, *ChemSusChem*, Volume 8, Issue 21, Nov. 2015
- 2015 Oak Ridge National Laboratory Significant Event Award on commercialization of tire-derived carbon composite for energy storage applications
- 2015 Who'sWho in America (69<sup>th</sup> Edition; Marquis)
- 2014 Oak Ridge National Laboratory Significant Event Award on successful renewable carbon fiber consortium proposal to Bioenergy Technologies Office of EERE
- 2013 Symposium Co-Organizer, *Polymer Precursor-Derived Carbon*, Polymer Division of American Chemical Society, New Orleans, Louisiana, April 7-11, 2013
- 2013 Oak Ridge National Laboratory Significant Event Award on successful mass processing of lignin at carbon fiber technology facility
- 2012 Oak Ridge National Laboratory Science & Technology Award for exceptional team R&D engineering accomplishments
- 2012 Journal outer front cover publication, *Green Chemistry*, Volume 14, Issue 12, Dec. 2012
- 2012 Co-Chair, ANTEC 2012, Orlando, FL. Nanofibers Session (M6) - Engineering Props. & Structure Div. (D26)
- 2012 Journal back cover-art publication, *Advanced Materials*, Volume 24, Issue 18, May 2012
- 2010 Oak Ridge National Laboratory Early Career Award in Engineering Accomplishment
- 2004 Featured presentation at International Carbon Conference (American Carbon Conference), July 11-16, 2004, Providence, RI
- 2002 Journal outer front cover publication, *Journal of Applied Polymer Science*, Volume 84, Issue 3, Feb. 2002
- 1998 First rank in the class of M.Tech. (Fiber Science & Technology), IIT/Delhi
- 1997 Junior Research Fellowship through National Eligibility Test conducted by Council of Scientific and Industrial Research and University Grant Commission of India
- 1996 First rank in the class of M.Sc. (Chemistry)
- 1996 National (India) Scholarship for conducting research in M.Tech. Program (Graduate Aptitude Test Examination; All India rank #46 in Chemistry)

### **Other Experience and Professional Memberships**

- 2004 – Present Member *American Carbon Society*
- 2003 – Present Member *American Chemical Society, Polymer Division*
- 2011 – Present Member *Society for the Advancement of Material and Process Engineering (SAMPE)*

Journal Article Reviewer: *ACS Applied Materials & Interfaces*  
*Acta Materialia*  
*Bioresource Technology*  
*Carbon*  
*ChemSusChem*  
*Composites Part A*  
*Composites Science and Technology*  
*Drug Development and Industrial Pharmacy*  
*Energy & Fuels*  
*ePolymers*  
*European Polymer Journal*  
*Green Chemistry*  
*International Journal of Hydrogen Energy*  
*Journal of Applied Electrochemistry*  
*Journal of Applied Polymer Science*  
*Journal of Materials Chemistry A*  
*Journal of Materials Science*  
*Journal of Physical Chemistry*  
*Journal of Physics and Chemistry of Solids*  
*Journal of Plastic Film and Sheeting*  
*Journal of Polymer and the Environment*  
*Langmuir*  
*Polymer Bulletin*  
*Polymer Chemistry*  
*Polymer Composites*  
*Polymer Engineering and Science*  
*Polymers and Polymer Composites*  
*Small*  
*The Journal of Chemical Physics*

Proposal Reviewer: *National Institute of Food and Agriculture (NIFA), US Department of Agriculture (USDA) 2015*  
*South Carolina NASA EPSCoR Program 2014*

## **Detailed Professional History**

### **Group Leader and Senior R&D Staff (10/2013 – Present)**

Carbon & Composites Group, Oak Ridge National Laboratory, Oak Ridge, TN

- Lead researcher for alternative precursor R&D focusing on biomass derived carbon materials and hydrocarbon-based polyolefin carbon precursors.
- Developed large-scale manufacturing of nanofibers from melt-processible carbon precursors and carbon paper for energy storage, filtration, and thermal energy management.
- A new method has been invented for reactive synthesis of alloys of phenolic resins and soft rubbery materials that form a nanoscale reinforced matrix with significantly ductility and strain hardening. A renewable polymer matrix with performance comparable to that of engineering plastic like nylon has been developed. Polymer materials development task lead on “Renewable polymers for 3d printing”. This technology is being commercialized by TennEra LLC.
- Invented a novel method for recovery of carbon materials from waste tire rubbers and utilized those as energy materials. Li-ion battery anode made with such tailored carbon show outstanding reversible capacity (400 mAh/g compared to 355 mAh/g for standard graphite materials). These carbons when activated chemically produced conducting porous carbon which forms nice flexible

films with conducting polymer such as polyaniline to form supercapacitor with 480 F/g capacity at 1 mV/s. These technologies are being commercialized by RJLee Group, Pittsburg, PA and FWD:Energy, Zanesville, OH.

- Developed lignin-derived activated mesoporous carbon with  $>1000 \text{ cm}^2/\text{g}$  BET surface area and  $1 \text{ cm}^3/\text{g}$  pore volume. The synthesized mesoporous carbons, when used as supercapacitor electrode materials, exhibited gravimetric specific capacitance of 77 – 102 F/g for pristine and carbons.
- Published several articles (10+ journal articles, three issued patent), several ORNL news release, and three significant event awards.

### **R&D Staff (4/2011 – 9/2013)**

Oak Ridge National Laboratory, Oak Ridge, TN

- Developed the chemistry and processing parameters of polyolefin-based low-cost carbon fiber that produced 200 ksi strength and 20 Msi modulus. (DOE-EERE-VT sponsored project)
- Technical lead of lignin-based carbon fiber R&D at ORNL. Designed formulations for spinning and stabilization for stretchable lignin precursors (significant stretchability during conversion after stabilization). However, that still does not solve porosity issue in the carbonized filaments. (LDRD funded project)
- Developed thermo-magnetic conversion protocol for high-performance polyacrylonitrile-based carbon fibers (DARPA-funded project)
- Currently leading polyolefin precursor commercialization tasks under a CRADA with Dow Chemical Company (DOE-AMO funded CRADA)
- Filed 5 patent applications. Disclosed several subject of inventions. Published several journal articles including 2 that were highlighted as cover in Advanced Materials and Green Chemistry.

### **R&D Associate (11/2008 – 3/2011)**

Oak Ridge National Laboratory, Oak Ridge, TN

- Developed lignin-based thermoplastic compositions for composite matrix applications. (LDRD-SEED project)
- Characterized processing conditions for high density oxidized PAN fibers under the direction of the principal investigator (DOE-EERE-VT funded project)
- Developed methods for production of carbon nanofibers and mats from melt-processible polyolefin fibers.
- Optimized the chemistry of stabilization and produced polyolefin-based carbon fibers with 150 ksi tensile strength and 15 Msi modulus.

### **Postdoctoral Research Associate (10/2006 – 10/2008)**

Oak Ridge National Laboratory, Oak Ridge, TN

- As a principal investigator initiated R&D effort of polyolefin-based carbon fiber precursors. Produced as-spun fibers from modified polyethylene and developed accelerated stabilization method (10 times faster than the published results) for successful conversion of such fibers.
- Established optimal degree of plasma oxidation requirement of PAN based carbon fiber precursors using differential scanning calorimetry (DSC) and acid digestion protocol for stabilized fibers.
- Determined optimal oxidative stabilization and conversion conditions for carbon fiber production from *in situ* morphological analysis during simulated conversion process inside sampling chamber of a wide angle XRD device.
- Installed and operated laboratory melt-spinning pilot plant, laboratory-scale carbon fiber precursor evaluation unit with designed retorts for continuous or semi-continuous oxidative stabilization and carbonization of various alternative precursors.

- Developed various routes of low-cost conversion technology from PAN, textile and lignin based precursors.
- As a team member wrote and participated in ten research proposals for continued funding, program development, LDRD and SEED funding calls at ORNL.
- Mentored one summer student intern and one graduate student from University of Tennessee.
- Disclosed of 6 inventions and demonstrated proof of concepts.

### **Postdoctoral Researcher (12/2002 – 10/2006)**

Department of Chemical Engineering, Department of Chemistry, & NSF Center for Advanced Engineering Fibers and Films (CAEFF), Clemson University, Clemson, SC

- Melt-spun and stabilized carbonaceous precursor fibers from lignin, petroleum pitch, polycarbosilane, and polyacrylonitrile. (CAEFF directed projects)
- Developed a new UV-assisted stabilization route for melt-processible PAN based carbon precursors. Optimized UV dosage requirement using FTIR, UV-Vis spectroscopy. (DOE sponsored project)
- Developed UV-thermal dual stabilization route for furfuryl alcohol impregnated carbon or precursor fiber reinforced composite laminates. Characterized the carbonized composites by FTIR and SEM.
- Characterized carbon fibers made from carbon nanotube dispersed petroleum pitch precursors using tensile, compressive, SEM, XRD and conductivity measurements. (NSF sponsored project)
- Characterized the rheo-structural response and effect of carbon nanofibers on morphological anisotropy of liquid crystalline fibers and films by XRD measurements. (NSF funded project)
- Correlated PET tire cord microstructure to creep performance using birefringence, XRD, density, intrinsic viscosity and DSC measurements. (Michelin sponsored project)
- Demonstrated a novel composite fabrication technique for space rigidization of inflatable antenna using resistive heating of polyether-imide thermoplastic (Ultem®) powder coated carbon fibers (towpreg). Characterized the composite by DSC, torsional rheology, tensile measurements and SEM. (NASA sponsored project)
- Solved rheological problem and processing difficulty of plastisols/emulsions for smooth coating of glass fiber yarns used in low-cost solar shielding application. (Mermet Weaving sponsored project)
- Produced and characterized co-extruded films and thermally bonded nonwovens using SEM, DSC, XRD and tensile measurements.

### **Research Assistant (11/2001 – 11/2002)**

Department of Chemical and Biochemical Engineering, University of Western Ontario, ON Canada

- Synthesized and characterized cationically polymerized styrene-isobutylene thermoplastic elastomeric block copolymers using GPC, FTIR, NMR, DMA, AFM and tensile measurements. (Bayer sponsored project)

### **Research Fellow [Graduate (Ph.D.) Student] (07/1998 – 10/2001)**

Rubber Technology Center, Indian Institute of Technology, Kharagpur, India

- Investigated effect of waste rubbers in NR and EPDM formulations. Characterized waste tire rubber powder using particle size analysis, DSC, TGA, atomic absorption spectroscopy of inorganic residue from TGA, DMA, IR spectroscopy, SEM, and energy dispersive x-ray spectroscopy.
- Produced modified rubber powders by surface chlorination and maleic anhydride grafting. Characterized surface modified powders using IR spectroscopy, DSC, XPS, and surface energy measurements.
- Determined the compatibility of chlorinated rubbers with PVC using DMA, DSC, DETA, SEM, and tensile and rheological measurements.

- Developed thermoplastic elastomeric (TPE) formulations based on HDPE/EPDM/waste rubber powder (modified and unmodified) blends and characterized their morphologies using DSC, DMA, SEM, TEM, tensile, tear and rheological measurements.
- Developed and processed fluoro- and silicone rubber blends as substitute of fluorinated silicones.

### **Production Engineer (12/1997 – 06/1998)**

Microsynth Fabrics (India) Limited, Silvassa, India

- Produced polyester (PET) low denier spun yarns (4500 lbs/day).
- Optimized the processing conditions for uniform low-denier PET yarn manufacturing.

### **Graduate (M.Tech.) Student (07/1996 – 12/1997)**

Department of Textile Technology, Indian Institute of Technology (IIT), New Delhi, India

- Ranked first in the class; major in fiber science and technology.

### **Graduate Research Intern (06/1997 – 11/1997)**

J.K. Tyres Limited, India (Sponsor of industrial research-a part of M.Tech. program)

- Identified the cause of differential compression-tension fatigue characteristics of Polyester and Nylon tire cords using intrinsic viscosity measurement of fatigued cords from a rubber composite.

### **Graduate (M.Sc.) Student (08/1994 – 07/1996)**

Institute of Chemical Sciences, Devi Ahilya University, Indore, India

- Ranked first in the class of 1996; major in physical chemistry.

### **Production Chemist (03/1994 – 08/1994)**

Nicholas Piramal Limited, Indore, India

- Produced pharmaceutical eye-care products in extruded LDPE vial and packed in thermoformed PVC blisters.

### **Laboratory Chemist (09/1993 – 02/1994)**

Rama Phosphates Limited, Indore, India

- Performed analysis and quality control of products in a soy-oil solvent extraction plant and a fertilizer manufacturing unit.

### **Under-Graduate (B.Sc.) Student (08/1989 – 08/1993)**

Vivekananda College, Calcutta University, Calcutta, India

- Honors in Chemistry

## **B. Publications**

### **Peer-Reviewed Journal Articles**

1. Li Y, Paranthaman MP,\* Akato K, Naskar AK, Levine AM, Lee RJ, Kim SO, Zhang J, Dai S, Manthiram A, Tire-derived Carbon Composite Anodes for Sodium-ion Batteries. **Journal of Power Sources** 316, 232-238 (2016).
2. Morris EA,\* Weisenberger MC, Abdallah MG, Vautard F, Grappe H, Ozcan S, Paulauskas FL, Eberle C, Jackson D, Mecham SJ, **Naskar AK\***, High Performance Carbon Fibers from Very High Molecular Weight Polyacrylonitrile Precursors. **Carbon** 101, 245-252 (2016).
3. Tran CD, Chen J, Keum JK, **Naskar AK,\*** A New Class of Renewable Thermoplastics with Extraordinary Performance from Nanostructured Lignin-Elastomers, **Advanced Functional Materials** (in press).
4. Imel AE, **Naskar AK**, Dadmun MD,\* Understanding the Impact of Polyethylene Oxide on the Assembly of Lignin in Solution Towards Improved Carbon Fiber Production, **ACS Applied Materials & Interfaces** 8 (5), 3200–3207 (2016).
5. Akato K, Tran CD, Chen J, Naskar AK,\* Poly(ethylene oxide)-Assisted Macromolecular Self-assembly of Lignin in ABS Matrix for Sustainable Composite Applications, **ACS Sustainable Chemistry & Engineering** 3(12), 3070–3076 (2015).
6. Boota M, Paranthaman MP,\* **Naskar AK**, LI Y, Akato K, Gogotsi Y,\* Waste Tire Derived Carbon–Polymer Composite Paper as Pseudocapacitive Electrode with Long Cycle Life, **ChemSusChem** 8(21), 3576 – 3581 (2015) [**Featured in the inside front cover of the issue**]
7. Ratnaweera DR, Saha D, Pingali SV, Labbe N, **Naskar AK**, Dadmun MD,\* The impact of lignin source on its self-assembly in solution, **RSC Advances** 5(82), 67258–67266 (2015).
8. Tekinalp HL, Kunc V, Velez-Garcia G, Duty CE, Love L, **Naskar AK**, Blue CA, Ozcan S.\* Highly Oriented Carbon Fiber-Polymer Composites via Additive Manufacturing, **Composites Science and Technology** 105, 144-150 (2014).
9. **Naskar AK,\*** Bi Z, Li Y, Akato SK, Saha D, Chi M, Bridges CA, Paranthaman MP.\* Tailored Recovery of Carbons from Waste Tires for Enhanced Performance as Anodes in Lithium-ion Batteries. **RSC Advances** 4, 38213 – 38221 (2014).
10. Saha D, Warren KE, **Naskar AK.\*** Controlled release of antipyrine from soft-templated mesoporous carbon, **Microporous and Mesoporous Materials** 196, 327-334 (2014).
11. Lu Y, Tekinalp HL, Eberle C, Peter W, **Naskar AK**, Ozcan S.\* Nanocellulose in Polymer Composites and Biomedical Applications, **TAPPI Journal** 13 (6), 47-54 (2014).
12. Tolbert A, Akinosho H, Khunsupat R, **Naskar AK**, Ragauskas AJ.\* Characterization and Analysis of the Molecular Weight of Lignin for Biorefining Studies, **Biofuels, Bioproducts & Biorefining** 8(6) 836-856 (2014).
13. Ragauskas AJ,\* Beckham GT, Bidy MJ, Chandra R, Chen F, Davis MF, Davison BH, Dixon RA, Gilna P, Keller M, Langan P, **Naskar AK**, Saddler JN, Tschaplinski TJ, Tuskan GA, Wyman CE. Lignin Valorization: Improving Lignin Processing in the Biorefinery, **Science**, 344, 1246843 (2014).
14. Saha D, Warren KE, **Naskar AK.\*** Soft-templated mesoporous carbons as potential materials for oral drug delivery, **Carbon** 71, 47-57 (2014).
15. Saha D, Li Y, Bi Z, Chen J, Keum JK, Hensley DK, Grappe HA, Meyer HM, Dai S, Paranthaman MP, **Naskar AK.\*** Studies on Supercapacitor Electrode Material from Activated Lignin-Derived Mesoporous Carbon, **Langmuir** 30(3), 900-910 (2014).
16. Saito T\*, Perkins JH, Vautard F, Meyer HM, Messman JM, Tolnai B, **Naskar AK.\*** Methanol Fractionation of Softwood Kraft Lignin: Impact to the Lignin Properties, **ChemSusChem** 7(1), 221-228 (2014).

17. Saito T, Perkins JH, Jackson DC, Trammel NE, Hunt MA, **Naskar AK**.\* Development of lignin-based polyurethane thermoplastics, *RSC Advances* 3, 44, 21832-21840 (2013).
18. Saha D, Payzant EA, Kumbhar AS, **Naskar AK**.\* Sustainable mesoporous carbons as storage and controlled-delivery media for functional molecules, *ACS Applied Materials & Interfaces*, 5 (12), 5868–5874 (2013).
19. Younker JM\*, Saito T, Hunt MA, **Naskar AK**, Beste A. Pyrolysis Pathways of Sulfonated Polyethylene, an Alternative Carbon Fiber Precursor. *Journal of the American Chemical Society* 135(16), 6130-6141 (2013).
20. Saito T, Brown RH, Hunt MA, Pickel DL, Pickel JM, Messman JM, Baker FS, Keller M, **Naskar AK**.\* Turning Renewable Resources into Value-Added Polymer: Development of Lignin-Based Thermoplastic. *Green Chemistry*, 14 (12), 3295-3303 (2012). [*Featured in the outer front cover of the issue*]
21. Hunt MA, Saito T, Brown RH, Kumbhar AS, **Naskar AK**.\* “Patterned functional carbon fibers from polyethylene”. *Advanced Materials*, 24(18), 2386-2389, (2012). [*Featured in the back cover of the issue*]
22. Banda M, **Naskar AK**, Perera KP, Moreland C, Hodge T, Wallace K, Beckham H, Smith DW Jr.\* Functionalization of Used Tire Rubber by Hydrosilylation. *Rubber Chemistry & Technology*, 85(1), 68-79, (2012).
23. Singh A, **Naskar AK**, Barden J, Drews MJ, Smith DW Jr.\* Terpolymers from Lactide and Bisphenol A Derivatives: Scale-up, Properties, and Blends. *Journal of Applied Polymer Science* 122(4), 2520-2528 (2011).
24. Singh A, **Naskar AK**, Haynes D, Drews MJ, Smith DW Jr.\* Synthesis, Characterizations and Surface Properties of Polylactic Acid (PLA)-Perfluoropolyether (PFPE) Block Copolymers. *Polymer International* 60 (3), 507-516 (2011).
25. Brown RH, Pickel JM, **Naskar AK**.\* Stress relaxation behavior and mechanical properties of functionalized polyolefins. *PMSE Preprint*, 353 (2010).
26. Warren CD\*, Paulauskas FL, Baker FS, Eberle C, **Naskar A**. Development of commodity grade, lower cost carbon fiber – Commercial applications. *SAMPE Journal*, 45 (2), 24 (2009).
27. Kundu S, **Naskar AK**, Ogale AA\*, Anderson DP, Arnold JR. Observations on a low-angle X-ray diffraction peak for AR-HP mesophase pitch. *Carbon*, 46, 1166- 1169 (2008).
28. Palkar A, Melin F, Cardona CM, Elliott B, **Naskar AK**, Edie DD, Kumbhar A, Echegoyen L.\* Reactivity differences between Carbon Nano Onions (CNOs) prepared by different methods. *Chemistry-An Asian Journal*, 2, 625-633 (2007).
29. Haynes D, **Naskar AK**, Singh A, Yang C-C, Burg K, Drews M, Harrison GM, Smith DW Jr.\* Poly(L-lactic acid) with Segmented Perfluoropolyether Enchainment. *Macromolecules*, 40, 9354-9360 (2007).
30. Mukundan T, Bhanu VA, Wiles KB, Johnson H, Bortner M, Baird DG, **Naskar AK**, Ogale AA, Edie DD, McGrath JE.\* A photocrosslinkable melt processible acrylonitrile terpolymer as carbon fiber precursor. *Polymer*, 47(11), 4163-4171 (2006).
31. Guo T, **Naskar AK**, Harrison GM, Ogale AA.\* Thermal and shear history effects on microstructure of a thermotropic liquid crystalline polymer. *Polymer Engineering and Science*, 46(9), 1215-1222 (2006).
32. **Naskar AK**, Edie DD.\* Consolidation of reactive ULTEM® powder coated carbon fiber tow for space structure composites by resistive heating. *Journal of Composite Materials*, 40(20), 1871-1883 (2006).



33. Walker RA, **Naskar AK**, Ogale AA.\* Carbon mats from melt-spun polyacrylonitrile-based precursors for automotive composites. *Plastic Rubbers and Composites*, 35(6/7), 242-246 (2006).
34. **Naskar AK**, Stevens K, Kennedy JM, Ogale AA,\* Chekanov Y. Morphology of PET cords at different stages of simulated tire building. *Textile Research Journal*, 76, 735-741 (2006).
35. **Naskar AK**, Walker RA, Proulx S, Edie DD, Ogale AA.\* UV assisted stabilization routes for carbon fiber precursors produced from melt-processible polyacrylonitrile terpolymer. *Carbon*, 43(5) 1065-1072 (2005).
36. Lee S, Kim MS, **Naskar AK**, Ogale AA.\* Effect of carbon nanofibers on the anisotropy of an aromatic thermotropic liquid crystalline polymer. *Polymer*, 46(8) 2663-67 (2005).
37. **Naskar AK**, Mukherjee AK, Mukhopadhyay R.\* Studies on tire cords: degradation of polyester due to fatigue, *Polymer Degradation and Stability*, 83(1), 173-180 (2004).
38. **Naskar AK**, De SK, Bhowmick AK.\* Influence of maleation of ground rubber tyre (GRT) on the thermorheological behaviour of thermoplastic elastomers based on ethylene propylene diene rubber, GRT and ethylene-co-acrylic acid, *Polymers and Polymer Composites*, 10(6), 427-432 (2002).
39. **Naskar AK**, Gala DP, De SK, Bhowmick AK.\* Thermorheological studies of plasticized polyvinylchloride filled with ground rubber tire and its chlorinated derivative, *Kautschuk Gummi Kunststoffe*, 55(4), 164-168 (2002).
40. **Naskar AK**, Khastgir D, Bhowmick AK, De SK.\* Effect of chlorination of ground rubber tire on its compatibility with polyvinyl chloride: dielectric studies, *Journal of Applied Polymer Science*, 84(5), 993-1000 (2002).
41. **Naskar AK**, De SK, Bhowmick AK.\* Thermoplastic elastomeric composition based on maleic anhydride grafted ground rubber tire, *Journal of Applied Polymer Science*, 84 (2), 370-378 (2002).
42. **Naskar AK**, Bhowmick AK, De SK.\* "Melt processible rubber: Chlorinated waste tire rubber filled polyvinyl chloride", *Journal of Applied Polymer Science*, 84(3), 622-631, (2002). [**Featured in the front cover of the issue**]
43. Nevatia P, Banerjee TS, Dutta B, Jha A, **Naskar AK**, Bhowmick AK.\* Thermoplastic elastomer from reclaimed rubber and waste plastics, *Journal of Applied Polymer Science*, 83 (9), 2035-2042 (2002).
44. **Naskar AK**, De SK, Bhowmick AK.\* Surface chlorination of ground rubber tire and its characterization, *Rubber Chemistry and Technology*, 74(4) 645-661 (2001).
45. Ghosh A, **Naskar AK**, Khastgir D, De SK.\* Dielectric properties of blends of silicone rubber and tetrafluoroethylene/propylene/vinylidene fluoride terpolymer, *Polymer*, 42(24), 9849-9853 (2001).
46. **Naskar AK**, Bhowmick AK, De SK.\* Thermoplastic elastomeric composition based on ground rubber tire, *Polymer Engineering and Science*, 41(6), 1087-1098 (2001).
47. **Naskar AK**, De SK, Bhowmick AK,\* Pramanik PK, Mukhopadhyay R. Characterization of ground rubber tire and its effect on natural rubber compound, *Rubber Chemistry and Technology*, 73(5) 902-911 (2000).

### **Manuscripts under Review**

1. Akato SK, Meyer HM, Erdman DL, **Naskar AK**, Modification of ABS engineering plastic for improved cost-performance index (under internal review).

2. Sun Q, Khunsupat T, Akato SK, Tao J, Labbé N,\* Gallego NC, Bozell JJ, Rials TG, Tuskan GA, Tschaplinski TJ, **Naskar AK**,\* Ragauskas AJ.\* Physicochemical Characteristics of Poplar Lignin Carbon Precursors before and after Melt Rheology, (under journal review).
3. Tran CD, Keum JK, Chen J, Gallego NC, Naskar AK,\* Graphene-Reinforced Porous Renewable Carbon Film for Supercapacitor Applications, (under journal review).
4. Bova T, Tran CD, Chen J, Naskar AK,\* A New Approach towards Tailoring Interfacial Structures and Properties of Multiphase Renewable Thermoplastics from Lignin–Nitrile Rubber (under internal review).

### **Edited Book**

1. Polymer Precursor derived carbon. Editors: Naskar AK, Hoffman WP, Volume 1173, American Chemical Society Symposium Series Publication (2014). [DOI: 10.1021/bk-2014-1173]

### **Book Chapters**

1. **Naskar AK**, De PP. Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) of Rubbers and Rubbery Materials, in “**Thermal analysis of rubbers and rubbery materials**” De PP, Roy Choudhury N, Dutta NK. (Editors), Rapra Technology, Shrewsbury, UK (2010).
2. **Naskar AK**. Thermal analysis in recycling of rubbery materials, in “**Thermal analysis of rubbers and rubbery materials**” P P De, N Roy Choudhury and N K Dutta (Editors), Rapra Technology, Shrewsbury, UK (2010).
3. Ozcan S, Vautard F, **Naskar AK**. Designing the Structure of Carbon Fibers for Optimal Mechanical Properties, Naskar AK, Hoffman W (Editors), American Chemical Society Symposium Series, Volume 1173, Chapter 10, pp 215-232 (2014).
4. Saha D, Renju Z, **Naskar AK**. Soft-templated Mesoporous Carbons: Chemistry and Structural Characteristics, Naskar AK, Hoffman W (Editors), American Chemical Society Symposium Series, Volume 1173, Chapter 4, pp 61-83 (2014).

### **Patents**

#### ***Issued Patents***

1. **Naskar AK**. “Method for Production of Carbon Nanofiber Mat or Carbon Paper” **US Patent No. 9,096,959** (2015). [U.S. Patent Application No. 13/402,139 (February 2012)]
2. **Naskar AK**, Hunt MA, Saito T. “Method for the preparation of carbon fiber from polyolefin fiber precursor, and carbon fibers made thereby”. **US Patent No. 9,096,955** (2015). [U.S. Patent Application No. 13/628,463 (September 2012). U.S. Provisional Patent Application No. 61/541,420 (September 2011)]
3. **Naskar AK**, Saito T, Pickel JM, Baker FS, Eberle CC, Norris RE, Mielenz JM “Lignin-derived thermoplastic co-polymers and methods of preparation” **U.S. Patent No. 8,748,537 (2014)**. [U.S. Patent Application No. 14/058,657 (October 2013)]. (**Licensed and being commercialized by TennEra, LLC, Knoxville, TN**)
4. Smith DWJr., Haynes D, **Naskar AK**. Fluorinated lactide-based copolymers. **U.S. Patent No. 7,695,795** (2010).

#### ***Pending Patent Applications***

5. Jackson CD, **Naskar AK**. Method of Producing Carbon Fibers from Multipurpose Commercial Fibers, (ORNL ID 3583), **U. S. Provisional Patent Application** No. 62/273,559 (filed on December 31, 2015).
6. Li Y, Paranthaman MP, Naskar AK, Akato K. Carbon-metal oxide composite materials and their use in anodes of lithium and sodium ion batteries (ORNL ID 3528) **U.S. Patent Appln. No.** 14/828,016 (August 17, 2015).
7. **Naskar AK**, Tran CD, High Performance Lignin-Acrylonitrile Polymer Blend Materials (ORNL ID 3426) **U.S. Patent Appln. No.** 14/798,729 (July 14, 2015).
8. Kunc V, Duty C, Love L, **Naskar AK**, Low Shear Process for Producing Polymer Composite Fibers (ORNL ID 3068), **U.S. Patent Appln. No.** 14/689,466 (April 17, 2015).
9. Ozcan S, **Naskar AK**, Infrared-Blocking Nanocellulose Aerogel Windows (ORNL ID 3296), **U.S. Provisional Patent Application** No. 62/132,178 (filed on March 12, 2015).
10. **Naskar AK** Polymer Blend Compositions and Methods of Preparation (ORNL ID 3165), **U.S. Patent Appln. No.** 14/311,893 (June 23, 2014)
11. Paulauskas FL, Ozcan S, **Naskar AK**. "Apparatus and Process for the Surface Treatment of Carbon Fibers", **U.S. Patent Application** No. 14/247,601 (April 08, 2014).
12. **Naskar AK** Paulauskas FL, Warren CD, Janke CJ "Sulfonated Polyolefin-Based Flame Retardant Material", **U.S. Patent Appln. No.** 14/175,218 (February 7, 2014).
13. **Naskar AK**, M. P. Paranthaman, Z. Bi. "Pyrolytic carbon black composite and method of making the same" **U.S. Patent Application No.** 13/945,239 (July 18, 2013).
14. **Naskar AK**. "Controlled Chemicals Stabilization of Polyvinyl Precursor Fiber, and High Strength Carbon Fiber Produced Therefrom" **U.S. Patent Application** No. 13/860,188 (April 10, 2013).
15. **Naskar AK**, Eberle CC, Ozcan S, Paulauskas FL, Ludtka GM, Mackiewicz-Ludtka G, Rivard JD, Abdallah MG. "Magneto-Carbonization Method for Production of Carbon Fiber, and High Performance Carbon Fibers Made Thereby" **U.S. Patent Application** No. 13/833,834 (March 15, 2013).
16. **Naskar AK** et al. "Sulfonated Polyolefin-Based Flame Retardant Material", U.S. Provisional Patent Appln. No. 61/762,489 (February 8, 2013).
17. **Naskar AK**, Hunt MA, Saito T. "Method for the preparation of carbon fiber from polyolefin fiber precursor, and carbon fibers made thereby". **U.S. Patent Application** No. 13/628,463 (September 2012).
18. Paulauskas FL, Ozcan S, **Naskar AK**. "Apparatus and Process for the Surface Treatment of Carbon Fibers", **U.S. Patent Application** No. 13/363,711 (February 01, 2012).
19. Paulauskas FL., **Naskar AK**, Bonds TA. Advanced oxidation method for producing high-density oxidized polyacrylonitrile fibers. **U.S. Patent Application** No. 13/163,134 (June 2011).

### ***Abandoned Patent Applications***

20. Naskar AK and Saha D. Lignin-Derived Porous Carbon Composition, Methods of Preparation, and Use Thereof, **U.S. Patent Application No. 13/766,229** (February 13, 2013).
21. **Naskar AK**, Saito T, Pickel JM, Baker FS, Eberle CC, Norris RE, Mielenz JM. "Lignin-derived thermoplastic co-polymers and methods of preparation" **U.S. Patent Application** No. 13/288,360 (November 2011).

### C. Abstracts in Conference Proceedings

1. **Naskar AK,\*** Tran CD, Akato K, Bova T, Chen J, Keum JK, Renewable thermoplastics from lignin with exceptional properties and their composites, CAMX 2016 Composites and Advanced Materials Expo, September 26-29, 2016, Anaheim, California.
2. Tran CD, Keum JK, Chen J, Gallego NC, **Naskar AK,** Renewable carbon film for supercapacitor applications, CARBON 2016, International Carbon Conference, July 10-15, 2016, Penn State University, PA.
3. Ho HC, **Naskar AK,** Hydrothermal synthesis of biomass derived particulate carbon, CARBON 2016, International Carbon Conference, July 10-15, 2016, Penn State University, PA.
4. **Naskar AK,\*** Akato SK, Erdman DL. Lignin expanded acrylonitrilebutadiene-styrene (ABS) thermoplastic for composite applications. 249th American Chemical Society National Meeting and Exposition, Denver, CO, March 22-26, 2015. POLY 411.
5. Paranthaman MP,\* **Naskar AK,** Li Y, Akato SK, Chi M, Li J, Nagasubramanian G. Low-cost, pyrolytic carbon black composite anodes for lithium-ion batteries. 249th American Chemical Society National Meeting and Exposition, Denver, CO, March 22-26, 2015. ENFL 127.
6. **Naskar AK,\*** Tran CD, Bova AS. Renewable thermoplastics from lignin. 249th American Chemical Society National Meeting and Exposition, Denver, CO, March 22-26, 2015 POLY 94.
7. Ime A, Dadmun MD, **Naskar A,** Impact of polyethylene oxide on the assembly of lignin structure in solution, ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY. Vol. 247. 1155 16TH ST, NW, WASHINGTON, DC 20036 USA: AMER CHEMICAL SOC, 2014.
8. Tran CD, Bova AS, **Naskar AK.\*** "Higher-performance lignin macromolecular derivatives" Frontier in Biorefining, St. Simons Island, Georgia, October 21-24, (2014).
9. **Naskar AK.\*** "Chemistry of char forming polymers as potential precursors for carbon fibers. Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, United States, April 7-11, 2013 (2013), POLY-627.
10. Saha D,\* Payzant EA, Kumbhar AS, **Naskar AK.** "Synthesis of porous carbon from renewable precursor" Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, United States, April 7-11, 2013 (2013), POLY-490.
11. Saha D, Hunt MA, Saito T, Ozcan S, Payzant EA, **Naskar AK,\*** "Microstructures of lignin-derived carbon fibers" Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, United States, April 7-11, 2013 (2013), POLY-486.
12. Ratnaweera DR, Saha D, Pingali SV, **Naskar AK,** Dadmun M, "Self-assembly of lignin molecules in solution" Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, United States, April 7-11, 2013 (2013), POLY-485.
13. Saito T,\* Perkins JH, Messman JM, **Naskar AK,** "Use of lignin as a carbon precursor: Effect of fractionation" Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, United States, April 7-11, 2013 (2013), POLY-484.
14. Ozcan S,\* **Naskar AK.** "Structure and properties of carbon fibers. Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, United States, April 7-11, 2013 (2013), POLY-257.
15. Ratnaweera D, Henry N, Saha D, **Naskar AK,** Dadmun M\*, "Neutron scattering studies of renewable materials for carbon fiber fabrication" Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, United States, April 7-11, 2013 (2013), POLY-488.
16. Saha D,\* Payzant EA, **Naskar AK.** Small-Angle X-ray Scattering (SAXS) of investigation of porous monolithic carbons from phenolic precursor. Plenary sessions on fundamentals and applications of adsorption and ion exchange. *AIChE annual meeting*, Pittsburgh, PA, Oct 28-Nov 02, 2012.

17. Saito T,\* Hunt MA, Perkins JH, **Naskar AK**. Development of Novel Lignin Polyurethane Thermoplastics, 44th IUPAC World Polymer Congress in Blacksburg, USA, 24–29 June 2012
18. Vautard F,\* Paulauskas FL, **Naskar AK**, Warren CD, Mayer HM III, Ozcan S. "Surface Treatment of Carbon Fibers by Continuous Gaseous System". SAMPE 2011, Long Beach, California, May 23-26 2011.
19. Brown RH, Pickel JM, **Naskar AK**. Stress relaxation behavior and mechanical properties of functionalized polyolefins. From Abstracts of Papers, 240th ACS National Meeting, Boston, MA, United States, August 22-26, 2010 (2010), PMSE-353.
20. Warren CD,\* Paulauskas FL, Baker FS, Eberle CC, **Naskar A**. "Multi-Task Research Program to Develop Commodity Grade, Lower Cost Carbon Fiber" Proceedings of the Society for the Advancement of Material and Process Engineering (SAMPE), Memphis, September 8-11, 2008.
21. Singh A,\* **Naskar AK**, Haynes D, Drews M, Smith DW Jr. "Highly Crystallizable, Better Processable, Very Low Surface Energy Polylactide-Perfluoropolyether Block Copolymer", *59th Southeast Regional Meeting of the American Chemical Society*, Greenville, SC, October 2007.
22. Banda MM,\* **Naskar AK**, Perera KPU, Smith DW, Moreland C, Hodge T, Wallace K, Pender M. "Functionalization of Used Tire Rubber by Hydrosilation and Modification of Epoxy Systems by Hydrosilated Rubber" *172<sup>nd</sup> Technical Meeting Rubber Division of the American Chemical Society*, October 16 – 18, 2007, Cleveland, OH.
23. Baker FS,\* Gallego NC, Paulauskas FL, **Naskar AK**. "Lignin-based Carbon Fibers for a Cleaner Environment," invited lecture at *Carbons for Energy Storage and Environment Protection, CESEP'07 Conference*, Krakow, Poland, September 2-6, 2007.
24. Warren CD,\* Eberle CC, Paulauskas FL, Baker FS, **Naskar AK**. Wheatley A. FreedomCAR and Low Cost Carbon Fiber for Automotive Applications, *Proceedings of 7<sup>th</sup> International Congress on Materials for Lean Weight Vehicles*, University of Warwick, Warwick, UK, 26<sup>th</sup> to 27<sup>th</sup> September 2007.
25. Baker FS,\* Gallego NC, Paulauskas FL, **Naskar AK**. Lignin-based Carbon Fibers: A Route to Energy Independence in the USA, *Proceedings of International Carbon Conference, Carbon2007*, July 15-20, 2007, Seattle, WA USA.
26. Warren CD,\* Paulauskas FL, Eberle CC, Baker FS, **Naskar AK**. Wheatley A. A Review of DOE Vehicle Lightweighting Materials R&D: The Development of Composite Materials Technologies and Affordable Carbon Fiber composites, *Proceedings of 15<sup>th</sup> Annual International Conference on Composite/Nano Engineering, ICCE-15*, Haikou, Hainan Island, China, 15-21 July 2007.
27. Singh A,\* **Naskar AK**, Haynes D, Drews M, Smith DW Jr. "Perfluoropolyether Macro-initiated Low Surface Energy Lactide Copolymer", *Macromolecules for a Sustainable, Safe and Healthy World (IUMACRO-07)*, Brooklyn, NY, June 2007.
28. Banda MM,\* **Naskar AK**, Perera KPU, Smith DW, Moreland C, Hodge T, Wallace K, Pender M. "Functionalization of Used Tire Rubber by Hydrosilation and Modification of Epoxy Systems by Hydrosilated Rubber" *7<sup>th</sup> National Graduate Student Research Polymer Conference (Am. Chem. Soc. Div. Polym. Chem.)*, June 3 – 7, 2007, Knoxville, TN.
29. Wheatley A,\* Warren CD,\* Paulauskas FL, **Naskar A**. Novel materials and approaches for producing carbon fiber, *Proceedings of 11<sup>th</sup> European Automotive Congress*, Budapest, Hungary 30 May – 1 June 2007.
30. Singh A,\* **Naskar AK**, Haynes D, Drews M, Smith DW Jr. "Polylactide-Perfluoropolyether Block Copolymer: Synthesis, Characterization & Applications", *233rd American Chemical Society National Meeting*, Chicago, IL, March 2007.

31. Melin F,\* Palkar A, **Naskar AK**, Kumbhar A, Edie DD, Echegoyen L. "Strategies for the preparation of small carbon nano-onions (CNOs)" Abstracts of Papers, 233rd ACS National Meeting, Chicago, IL, United States, March 25-29, 2007 (2007), COLL-397.
32. Palkar A,\* Melin F, **Naskar AK**, Kumbhar A, Edie DD, Echegoyen L. "Know your onions": Reactivity and potential uses of carbon nano-onions, Abstracts of Papers, 233rd ACS National Meeting, Chicago, IL, United States, March 25-29, 2007 (2007), COLL-397.
33. Singh A,\* **Naskar AK**, Haynes D, Drews M, Smith DW Jr. "Novel Fluorinated Polylactide as a Low Surface Energy Ductile Plastic and High Elongation Melt Spun Fibers", *National Textile Center 15th Annual Forum*, Hilton Head, SC, February 2007.
34. Singh A,\* **Naskar AK**, Haynes D, Drews M, Smith DW Jr. "Renewable Resource Lactide Derived Polymers for Commodity Applications", *Fluoropolymer, ACS Conference*, Charleston, SC, October 2006.
35. Haynes D,\* Smith DW, **Naskar A**, Singh A. "Combining renewable resource biopolymers with fluoropolymers: Where green meets mean". Abstracts of Papers, 232nd ACS National Meeting, San Francisco, CA, United States, Sept. 10-14, 2006 (2006), POLY-650.
36. Palkar A,\* Melin F, **Naskar AK**, Kumbhar A, Edie DD, Echegoyen L. "Synthesis and characterization of small functionalized carbon nano onions". Abstracts, 58th Southeast Regional Meeting of the American Chemical Society, Augusta, GA, United States, November 1-4 (2006), SRM06-049.
37. **Naskar AK**,\* Stevens K, Chekanov Y, Kennedy JM, Ogale AA. "Morphology of PET tire cords: X-ray diffraction". *Polymeric Materials: Science and Engineering Preprints* (2005), 93 175.
38. Kundu S,\* Sweeney D, **Naskar A**, Ogale AA. "Reduction of Anisotropy of Mesophase Pitch-based Carbon Fibers with Multi-Wall Carbon Nanotubes: Rheology and Microstructure of Pure and MWNT-Modified AR-HP Mesophase Pitches", *Carbons for a Greener Planet Research Frontiers Workshop*, May 23-25, 2005, Penn State, PA.
39. **Naskar AK**,\* Walker RA, Proulx S, Edie DD, Ogale AA. "UV-assisted stabilization routes for carbon precursor fibers produced from melt-processable PAN terpolymers" Proceedings of International Carbon Conference, Carbon2004, July 11-16, 2004, Providence, RI USA (**One of the featured presentations in the conference**).
40. **Naskar AK**, Walker RA, Proulx S, Edie DD, Ogale AA,\* Baird DG, McGrath JE, Mukundan T, Bhanu VA, Bortner M. "Ultraviolet radiation crosslinking for stabilization of melt-spun polyacrylonitrile carbon precursor fibers" Abstract #288 Proceedings of Polymer Processing Society 2004 annual meeting & 20th anniversary, PPS-20, June 20-24, 2004, Akron, Ohio USA.
41. **Naskar AK**,\* Walker RA, Proulx S, Edie DD, Ogale AA. "UV-assisted stabilization of melt-processable pan carbon precursor fibers" Proceedings of 11th European Conference on Composite Materials, ECCM 11, May 31-June 3, 2004, Rhodes, Greece.
42. **Naskar AK**,\* Walker RA, Proulx S, Edie DD, Ogale AA. "UV stabilization of melt-processable PAN carbon precursor fibers" Abstracts, 55th Southeast Regional Meeting of the American Chemical Society, Atlanta, GA, United States, November 16-19, (2003), 869.
43. Chattopadhyay S, Kwon Y,\* **Naskar AK**, Bhowmick AK, Puskas JE. "Novel Dendritic (Arborescent) Polyisobutylene-Polystyrene Thermoplastic Elastomers" Technical Papers - American Chemical Society, Rubber Division, [Fall Technical Program], 162nd, Pittsburgh, PA, USA, Oct. 8-11, 2002, 454-471.
44. **Naskar AK**, Jacob C, De PP, Bhowmick AK, De SK.\* "Thermoplastic elastomers based on ground waste rubber" Proceedings of 17th Polymer Processing Society (PPS) Conference, Montreal, Canada, 21-24 May, 2001.

45. **Naskar AK**,\* Bhowmick AK, De SK. "Thermoplastic elastomeric composition based on waste rubber tire" National Rubber Conference 'RubTech 2000', New Delhi, India, February 18-21, 2000.
46. **Naskar AK**,\* Bhowmick AK, De SK. "Recent trends in rubber recycling" International Rubber Conference-"IRC98" Chennai, India, 8-9 Dec. 1998.

#### **D. Invited Presentations**

1. "Novel Materials for Sustainable Polymer Matrix Composites" Dave C Swalm School of Chemical Engineering, Mississippi State University, February 23, 2016.
2. "Conversion of Biomass Residues to Engineered Bioproducts" Center for Renewable Carbon Seminar, University of Tennessee Institute of Agriculture, June 19, 2015.
3. "Alternative Precursor Chemistries and Conversion Technologies for Carbon Fiber Manufacturing" Carbon Fibers and Their Composites, An American Carbon Society Workshop, Oak Ridge, TN, April 16, 2015.
4. "Networked Structure and Properties of Lignin-Based Thermoplastics", 2014 AIChE Annual Meeting in Atlanta, GA. Polymer Networks and Gels Session, Nov 20, 2014.
5. "Biomass-derived polymeric materials and value-added products" 8<sup>th</sup> Biopolymers Symposium, June 11-12, 2013, Chicago, IL.
6. "Turning alternative precursors into low-cost carbon fibers" RISE 2012 Conference, Baltimore, MD, October 25, 2012.
7. "Development of lignin-based thermoplastics for composite applications" Keynote Presentation in ANTEC2012, Orlando, FL. April 02, 2012.
8. "ORNL's R&D Initiatives on Low-Cost Carbon Fibers" Panel Discussion on New Fiber Technologies – "Back to the Future," and Fiber Breakthroughs We Hadn't Considered. SAMPE 2011. May 25, 2011, Long Beach, CA.
9. "Developing Low Cost Carbon Fiber for Automotive Lightweight Composites" 32nd Annual Meeting, The Council for Chemical Research, Dearborn, MI. May 03, 2011.
10. "Exclusive Case Study: Developing Low Cost Carbon Fiber". Advanced Lightweight Materials for Vehicles Summit. August 12, 2010. Detroit, MI.
11. "Low-Cost Carbon Fibers for Automotive Applications" – Department of Polymer Engineering, the University of Akron, Akron, OH, April 30, 2010.
12. "PAN precursor spinning" in "Carbon Fiber for Tomorrow –A Review of Current Technologies and the Path to Wide Spread Industrial Growth" Preconference Seminar-I at Composites World Conferences on CarbonFiber2009, Dec 9, 2009. San Diego, CA.
13. "Polyacrylonitrile Based Precursors and Carbon Fibers for Low-Cost Automotive and High Performance Space Structural Composites" Oak Ridge National Laboratory, Oak Ridge TN, June 20, 2006.
14. "Research and Development Activities on Carbon Fibers for Composite Applications" Cantor Colburn LLP., Bloomfield, CT, May 17, 2006.
15. "Creep in Polyester Tire Cord", AutoPolymers 2005, Workshop on Integrating Polymer Systems and Advanced Processing Methods in the Automotive Industry, Charleston, SC October 28-31, 2005.
16. "Carbon Fibers for Composite Applications" BorgWarner, Inc., Auburn Hills, MI, September 12, 2005.

17. "Co-carbonized Composites from UV Stabilized Melt-Processed PAN Fiber/Polyfurfuryl Alcohol Matrix", Carbons for a Greener Planet Research Frontiers Workshop, Penn State University, PA, May 23-25, 2005.
18. "Composition and Process-based Control of Microstructure in Value-Added Fibers and Films" The Coca Cola Company, Atlanta, GA, April 22, 2005.
19. "Variation of Coated Yarn Diameter and On-line Monitoring" Mermet Weaving, Cowpens, SC, January 27, 2005.

## E. Research Support

### Ongoing Research Support

1. DOE-BETO, \$500,000 4/1/2016-9/30/2018  
 Funding Agency: DOE-EERE- BIOENERGY TECHNOLOGY OFFICE  
**Melt-stable engineered lignin thermoplastic: a printable resin**  
 The goal of this project is to understand melt-stability and rheological characteristics of biorefinery lignins and their derivative high performance thermoplastics **(Role: Principal Investigator)**
2. Technology Innovation Program, \$200,000 11/1/2015-10/30/2016  
 Funding Agency: UT-Battelle LLC (Royalty Fund)  
**Low-cost Amorphous Polymer with Extraordinary Performance**  
 The goal of this project is to develop high performance plastics. **(Role: Principal Investigator)**
3. Technology Innovation Program (Phase –II), \$175,000 5/1/2015-4/30/2016  
 Funding Agency: UT-Battelle LLC (Royalty Fund)  
**Lignin-derived high-performance plastics for composite matrix applications**  
 The goal of this project is to develop low-cost lignin-based high performance plastics. **(Role: Principal Investigator)**
4. DOE-ADVANCED MANUFACTURING, \$3,200,000 1/2/2015-9/30/2018  
 Funding Agency: DOE-EERE- ADVANCED MANUFACTURING OFFICE  
**Low-Cost Bio-Based Carbon Fiber for High Temperature Processing**  
 The goal of this project is to develop lignin-based carbon fiber (LBCF) technology and demonstrate LBCF performance in high-temperature products and applications. **(Role: Principal Investigator for ORNL tasks)**
5. DOE-BETO, \$1,700,000 4/1/2015-9/30/2018  
 Funding Agency: DOE-EERE- BIOENERGY TECHNOLOGY OFFICE  
**Renewable Carbon Fiber Consortium-ORNL**  
 The goal of this project is to demonstrate successful conversion of bio-derived acrylonitrile (bio-ACN) to low-cost carbon fiber for automotive application. The project is led by National Renewable Energy Laboratory that is producing bio-ACN from biomass conversion pathways. **(Role: Principal-Investigator for ORNL)**



## Completed Research Support

6. DOE-LAB DIRECTOR'S R&D, \$700,000 10/6/2012-9/30/14  
Funding Agency: DOE-ORNL  
**Low-cost tailored carbon nanocomposite for polymer additive manufacturing**  
The goal of this project is to develop low-cost carbon nanofiber for additive manufacturing of polymer matrix composites. **(Role: Co-Investigator)**
7. (DOE-LAB DIRECTOR'S R&D (SEED), \$190,000 4/29/2013-9/30/14  
Funding Agency: DOE-ORNL  
**Synthesis of Tin-Doped Indium Oxide Nanofibers**  
The goal of this project is to develop low-cost ITO nano-fibers for flexible electronic materials. **(Role: Co-Investigator)**
8. Technology Innovation Program (Phase –I), \$150,000 10/6/2013-9/30/14  
Funding Agency: UT-Battelle LLC (Royalty Fund)  
**Low-Cost, Pyrolytic Carbon Black Composite Anodes For Lithium-Ion Batteries**  
The goal of this project is to develop develop a scalable recovery process starting from a *recycled, low-cost, and abundant rubber tires* to produce morphologically tailored pyrolytic carbon black composites and demonstrate its feasibility as anodes in lithium ion batteries. **(Role: Co-Principal Investigator)**
9. Technology Innovation Program (Phase –I), \$150,000 10/6/2013-9/30/14  
Funding Agency: UT-Battelle LLC (Royalty Fund)  
**Lignin-derived high-performance plastics for composite matrix applications**  
The goal of this project is to develop low-cost lignin-based high performance plastics. **(Role: Principal Investigator)**
10. DOE-LAB DIRECTOR'S R&D, \$700,000 10/6/2011-9/30/13  
Funding Agency: DOE-ORNL  
**Conversion of Lignin Feedstock into an Economic Automotive Grade Carbon Fiber**  
The goal of this project is to develop low-cost carbon fiber from lignin. **(Role: Principal Investigator)**
11. DOE B&R No. ED1904032, \$2,000,000 out of \$5,000,000 4/1/2010-9/30/13  
Funding Agency: DOE –EERE Industrial Technologies Program office  
**Development and Commercialization of Alternative Carbon Fiber Precursors and Conversion Technologies** (Dow-ORNL CRADA),  
The objective of this project is to develop, demonstrate, and commercialize alternative technology to produce polymer fiber precursors and scaled energy-efficient advanced conversion technology to enable manufacturing of carbon fibers that are technically and economically viable in industrial markets. **(Role: Co- Investigator and Task Leader in the multi-task CRADA)**
12. DOE B&R No. VT0505000 (agreement #18899), \$1,800,000 5/1/2009-9/30/2012

Funding Agency: DOE -EERE Vehicle Technologies Program office

***Polyolefin based carbon fiber precursors.***

The goal of this project is to develop low-cost carbon fiber from polyolefin thermoplastic by chemical functionalization. **(Role: Principal Investigator)**

13. LDRD SEED S10-023(LOIS #5866) \$175,000 12/9/2009-9/30/2010

Funding Agency: DOE-ORNL

***Synthesis of High Performance Lignin-Derived Bio-Thermoplastics***

The goal of this project was to develop new families of recyclable thermoplastics incorporating various types of commercial lignins. **(Role: Principal Investigator)**

14. DOE B&R No. VT0505000 (agreement #16622) 10/1/2007-9/30/2009

Funding Agency: DOE -EERE Vehicle Technologies Program office

***Full Scale Development of Commercial Textile Precursors (PAN-VA) using Chemical Pretreatment.***

The goal of this project was to develop a conversion and characterization protocol for a textile-based PAN precursor for low-cost carbon fiber production. **(Role: Co-Investigator)**

15. Multi-Task CRADA # ORNL02-0644 (Task #05) 5/1/2008-3/31/2010

Funding Agency: Private Company

***Accelerated Commercialization of Lignin-Based Carbon Fibers***

The goal of this project is to develop a conversion and characterization protocol for lignin-based polymeric fibers through an optimization of shrinkage force and relative shrinkage of the fibers at various thermo-oxidative crosslinking conditions. **(Role: Co-Investigator)**

16. DOE B&R No. 400403809, \$4,000,000 (total) 6/1/2010-12/31/2011

Funding Agency: DARPA

***Advanced Structural Carbon Fibers***

The goal of this project is to develop ultra-high strength advanced structural carbon fibers from polyacrylonitrile precursors. **(Role: Co-Investigator)**

## **F. Areas of Research Interest**

Biomaterials

Sustainable materials

Carbon fibers & carbonaceous materials

High performance fibers

Polymers and liquid crystals

Composites and their interfacial chemistry

Ceramic and polymer based energy materials and electronic applications

Rapid prototyping of composite parts

Polymer recycling

Porous materials

Printable composites

## G. Postdoctoral Fellow Advisees

1. **Dr. Rebecca H Brown** (2009-2010), “Stabilization of polyolefin fibers”, PhD from Virginia Polytechnic Institute and State University; Supervisor: Prof. Timothy E. Long. Currently Assistant Professor at West Kentucky Community and Technical College, Paducah. Kentucky.
2. **Dr. Marcus A Hunt** (2010-2012), “Carbonization of alternative fiber precursors”, PhD from North Carolina State University; Supervisor: Prof. Alan E Tonelli. Currently Assistant Professor at Fayetteville State University, Fayetteville, NC. Recently joined DuPont at Fayetteville, NC.
3. **Dr. Tomonori Saito** (2010-2012), “Chemistry of carbon precursors”, PhD from Virginia Polytechnic Institute and State University; Supervisor: Prof. Timothy E. Long. Currently Research Staff Member at Chemical Science Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
4. **Dr. Dipendu Saha** (10/2011-7/2013), “Porous sustainable carbon”, PhD from New Mexico State University; Supervisor: Prof. Shuguang Deng. Currently Assistant Professor at Department of Chemical Engineering, Widener University, PA
5. **Dr. Chau D. Tran** (6/2014- present), “Porous carbon electrode and its precursors” PhD from Drexel University; Supervisor: Prof. Vibha Karla.

## H. Graduate Student Advisee

1. **Mr. Antony Bova** (August 2013 - present), “Renewable Polymers” Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville, TN.
2. **Mr. Hoi Chun Ho** (January 2015 - present), “Compatibility of Polymers with Liquefied Hydrogen” Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville, TN.
3. **Mr. Kokouvi (Sam) M. Akato** (August 2015 – present), “High performance composites” Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville, TN.

## I. Dissertation/Thesis Committee Member

1. **Nitilaksha P. Hiremath**, Department of Materials Science and Engineering, University of Tennessee, Knoxville (Advisor: Prof. Gajanan Bhat)

## J. Graduate Student Mentees

1. **Dr. Arun Ghosh** (1999-2001 at IIT Kharagpur, India); currently employed at AgResearch Lincoln, New Zealand.
2. **Dr. Santanu Kundu** (2003-2006 at Clemson University); currently Assistant Professor at Mississippi State University, Starkville, MS.
3. **Mr. Madan Banda** (2006 at Clemson University); currently employed at Ockham Development Group as clinical SAS Programmer, Raleigh-Durham, NC
4. **Dr. Akhilesh Singh** (2006 at Clemson University); currently employed at Greene, Tweed & Co., Inc., Kulpsville, PA.

## K. Post-MS/BS Fellow Advisees

1. **Mr. Kokouvi (Sam) M. Akato** (May 2013 – July 2015), “Processing of carbon precursors”, MS from UTK; Supervisor: Prof. Gajanan Bhat.
2. **Mr. Joshua M. Perkins** (June 2011 – May 02, 2014). “Chemical modification of lignin”. BS from University of Tennessee-Knoxville (Chemistry and Biochemistry). Currently enrolled in Physician’s Assistant Program at Lincoln Memorial University, Tennessee.
3. **Mr. Matthew M. Melton** (July 2012 – March 2013). “Lignin derived polymers” BS from University of Tennessee-Knoxville (Chemical Engineering). Currently employed at Dow Chemical Company, Knoxville.

## L. Summer Undergraduate Advisees

1. **Mr. Christopher Bowland** (June-Aug 2011) UT-Knoxville (Materials Science & Engg.), Currently a PhD candidate at University of Florida, Gainesville (with Prof. Henry Sodano).
2. **Mr. Daniel Jackson** (June-Aug 2011) Vanderbilt University. Currently a PhD candidate at University of California, Davis.
3. **Mr. Neil Trammell** (June-Aug 2011), University of Kentucky College of Engineering, Paducah, Kentucky. Currently at Ashland Chemicals.
4. **Ms. Laura Poland** (Aug-Dec 2011), University of Tennessee-Knoxville (Materials Science & Engg.). Currently employed at Techmer PM, Clinton, TN.
5. **Mr. Reed Wittman** (June –Aug 2012), Arizona State University, (Materials Science & Engg.). Currently a Bredesen Fellow at University of Tennessee-Knoxville.
6. **Ms. Kaitlyn E. Warren** (June –Aug 2012), University of Tennessee-Knoxville (Chemical Engineering). Currently a freshman in Class of 2016.
7. **Mr. Tyler Tommey** (June – Aug 2012), Northwest Missouri State University, Maryville, Missouri. Currently a senior in College.
8. **Mr. William Meredith** (SULI, June – Aug 2013), The University of Mississippi. Currently a junior student in Chemical Engineering.
9. **Mr. Mark Goldman** (HERE, June – Aug 2014), University of Texas, Austin (Chemical Engineering). Currently a graduate student at Massachusetts Institute of Technology.
10. **Mr. Duncan Greeley** (SULI, June –Aug 2014), University of Tennessee, Knoxville (Materials Science & Engineering).
11. **Mr. Jack E. Gritton** (Volkswagen intern, June –Aug 2014), University of Tennessee, Knoxville (Materials Science & Engineering)
12. **Mr. Seth Trammell** (SULI, June –Aug 2014), University of Kentucky, Paducah (Materials Science & Engineering). (Currently at Ashland Inc.)
13. **Mr. Hicham Ghossein** (HERE, June – Aug 2015), University of Alabama, Birmingham (Materials Science & Engineering).
14. **Mr. James Brackett** (Volkswagen intern, June –Aug 2015), University of Tennessee, Knoxville (Materials Science & Engineering).