## Textile Engineering, Chemistry and Science (TECS)
### Annual Report for 2011-2012

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Textile Engineering, Chemistry and Science (TECS) Mission, Vision and Core

Values

Administrative Achievements

1. **Outstanding TECS faculty productivity** through ongoing undergraduate student recruitment; ongoing partnerships with Donghua University in Shanghai, the Colleges of Engineering and PAMS, the First Year College and many others; the contributions of our two outstanding centers in the College of Textiles; and with the outstanding effort of our faculty to secure research funding:

   - Undergraduate enrollment (Fall 2011) in TECS is at an all-time high: 350 + students
     - Polymer and Color Chemistry: 130
     - Textile Engineering: 140
     - Textile technology: 88
   - Graduate enrollment is at an all-time high: 125 + students
     - MS TE: 29
     - MS TC: 20
     - PhD’s funded and/or directed by TECS faculty: 75 +
   - TECS faculty taught 65% of graduate student credit hours for the College of Textiles
   - TECS faculty taught 40% of all student credit hours taught by the College of Textiles
   - TECS faculty (not including the centers) generated 50% of the COT F&A. If TECS faculty-led centers are included, F&A generated was at least 90% of the COT total.

2. **Hanesbrands Strategic Partnership** led by Dr. Jeff Joines:

   - $1,000,000 over five years to support Senior Design projects, graduate students, laboratory use
   - Hanesbrands will be recruiting our students for intern work at the college and full-time employment upon graduation
   - Hanesbrands will have full time employees working here at the college
3. **Forensic Sciences Institute** accomplishments, led by Dr. David Hinks:

- The Forensic Sciences Institute is active and searching for four new faculty after being selected for the Chancellors Faculty Excellence Program funding
- Dr. Hinks has been appointed to the new state-legislated NC Forensic Science Advisory Board by NC Attorney General Roy Cooper
- Successfully delivered the 4th Annual NC State Forensic Science Symposium
- Developed and delivered a new National Institute of Justice Workshop: “Dyes, Fibers and Advances in Textiles”
- Dr. Hinks was named a member of the National Institute of Justice Trace Evidence Steering Committee
- PCC 274: Introduction to Forensic Science, a General Education, Interdisciplinary Perspectives course a second time: as a First-year Inquiry course

4. **Composites Research Accomplishments** led by Drs. Alexander Bogdanovich and Philip Bradford

- Dr. Alex Bogdanovich joined TECS as a self-funded Research Professor in July 2011
- In his first year, Dr. Bogdanovich has published six peer-reviewed publications and generated over $600,000 in research contracts
- Dr. Bogdanovich is planning to host the TexComp 2015 International Conference on Textile Composites at NC State University
- Dr. Bradford joined the faculty as Assistant Professor in 2010 working in nanocomposites
- Drs. Bogdanovich and Bradford combined were awarded $1.5 million in research funding in composites and nanocomposites in the 2011-2012 fiscal year
Changes in the TECS Service Environment:

Dr. Melissa Pasquinelli was promoted to Associate Professor.

Dr. Martin King was named Chaired Professor of Medical Textiles at Donghua University

Dr. Stephen Michielsen accepted the position of Director of Professional Development for Graduate Scholars working with graduate students and Post-Doctoral Scholars

Ms. Amanda Holbrook accepted Ms. Collie’s former position in TECS as Executive Assistant.

Dr. Bhupender Gupta completed his retirement in June 2011. The budget giveback last year eliminated his position and the salary was taken by the college.

Ms. Angie Brantley retired from the department after nine years of service. The budget giveback last year eliminated her position and the salary was taken by the college.

Ms. Kathryn Collie left to accept a position as Administrative Assistant to the Senior Vice President at Horry-Georgetown Technical College.

Salary reserves for TAs were taken by the college for the budget giveback last year.

Dr. Alexander Bogdanovich was hired in July 2011 in a self-funded position of Research Professor. See the section above for an update on the accomplishments Dr. Bogdanovich has made since joining TECS.

Budget cuts have caused:

- TECS is able to offer only a few graduate student stipends as a recruitment tool as a result of the budget givebacks. The number of stipends has been reduced by 60% and the value of each stipend has also been cut by in half.

- Faculty salary release funds were taken back (partial) by the department in late 2011. These normally are returned entirely to the faculty member to assist them with their research efforts.

- The TECS office is having a difficult time keeping up with the workload since the loss of Ms. Brantley and I question the ability of the office staff to maintain the work load indefinitely. TECS office staff is extremely efficient and without this efficiency we would see faculty productivity reduced significantly.

- Our opportunities are great and our resources are few. Still, TECS faculty are among the most productive in the university.
TECS Strategic planning

Steps TECS has taken to revise current strategic plan to align with The Pathway to the Future?

1. Enhance the success of our students through educational innovation.
   - Collaborate with EH&S: ensure a safe work environment for all Faculty, Staff and Students.
   - College programs continuously revise UG curricula and assessment activities.
   - Created volunteer position: Director of Professional Development for Graduate Scholars.
   - NCSU’s Global Health Initiative (Dr. McCord) and faculty from BME, Poole COM, COD and the Engineering Entrepreneurship Initiative develop global health-focused senior design projects. Students face real-world health problems in communities needing improved healthcare technology and services.
   - Dr. Billy Oliver delivered the first NC State course in professional practice in Forensic Science.
   - Dr. Barker delivered the first graduate course at NC State devoted to protective textiles.
   - 12 Faculty Excellence Proposals, partnering for interdisciplinary research & education.
   - Rewarding course improvement while reducing the number of classes and increasing class size while maintaining a personalized learning environment.
   - Dr. Willoughby restructured the Textile Engineering capstone course to be a multi-disciplinary design experience with multiple programs in TECS and other departments in the College of Engineering and beyond. Four industrial partners sponsored projects in 2011-2012.
   - Coordinating opportunities for graduate students to participate in the CoAT Program: Certificate of Achievement in Teaching (Graduate School).
   - Dr. Shamey instituted weekly seminars in color science.
   - Drs. Tonelli and Pasquinelli are active in research and committed to Project SEED, working with high school students each summer encouraging interest in a university education in a STEM field.

2. Enhance scholarship and research by investing in faculty and infrastructure.
   - Partners in 12 Faculty Excellence Program proposals, leading forensic sciences proposal.
   - Invested in the Forensic and Analytical Laboratory, Antimicrobial Test Facility and Medical Textiles Laboratory, Tissue Engineering Laboratory, the Lithium Ion Battery and Fuel Cell Laboratory, Nanocomposites Laboratory, NEXT (Nano-Extended Textiles Research) Laboratory, Extrusion Laboratory, and the Dye-Sensitized Solar Cell Laboratory.
   - Invested in composites infrastructure & faculty, result: $1.5 million in research funding in the past six months.
- Active participant in planning the Aerospace and Advanced Manufacturing Development Research Center and other university-wide interdisciplinary research initiatives.

- Searching for a Co-Director for the Textile Protection and Comfort Center (T-PACC).
- Searching for new faculty for the Forensics Sciences Institute (FSI).

3. Enhance interdisciplinary scholarship to address the grand challenges of society.

- Health and Safety
  - TECS faculty members have funded interdisciplinary research in:
    - textile solutions for malaria,
    - filtration for clean air, water and blood,
    - nanofiber-based tissue engineering scaffolds,
    - antimicrobial surfaces for better medicine and clean water,
    - new forensic techniques for CSIs and law enforcement.
  - Dr. Barker and TPACC collaborates with ISE in human protection and comfort, especially for first responders. TPACC serves US companies involved in Homeland Security and Defense Projects and also governmental agencies.
  - Dr. Bradford utilizes carbon nanotubes for ultra-high efficiency filtration and aerospace structural components.
  - Drs. El-Shafei, Hauser, Hinks, and Shamey, are reducing water and energy use in traditional textile dying operations through partnerships with Cotton Incorporated.
  - Dr. Freeman creates dyes for photodynamic therapy: to kill cancer cells.
  - Dr. Ghosh creates knowledge in biomimetics, partnering with world leaders.
  - Dr. Gorga coordinates an interdisciplinary research program to scale-up nanofiber production for use in medicine, affordable solar energy and water filtration.
  - Dr. King collaborates with industry partners to manufacture scaffolds in bulk quantities, moving this therapy from the "lab bench" to the "bedside".
  - Dr. Marian McCord (TECS and BME) is university Director of Global Health. Her strategic partnership at Sustainable Health Enterprises (SHE) has led to collaborations with universities around the world. She partnered with Duke and UNC to organize the Triangle Global Health Case Competition where more than 150 students work in multidisciplinary teams to solve a real world global health problem. Her invention for using textile filters for kidney disease led to funding from
NCTracs, the Wallace H. Coulter Foundation and a Grand Challenges Graduate Fellowship from the Golden Leaf Foundation.

- Dr. Oxenham partners with faculty in ECE to create wound dressings, particularly targeting people suffering from diabetes.
- Dr. Pourdeyhimi collaborates with numerous industry partners in filtration and other health related areas through the Nonwovens Institute.
- Dr. Willoughby was awarded a Bill and Melinda Gates Foundation grant for crop protection by using controlled release strategies for bioactive agents.
- TECS invests in infrastructure and personnel for the FSI. Dr. Hinks is creating a Professional Science MS degree in Forensic Science and Engineering.
- TECS is creating a Medical Textiles Scientific Advisory Committee from industry leaders, academic experts, and leaders in the medical community.

- Sustainability and Energy

- Dr. El-Shafei creates new for solar cells that far outperform current technology.
- Dr. Pasquinelli has revised TE 303 “Thermodynamics for TEs” to have a focus on sustainability of textile processes and has developed and delivered a new graduate course: “Sustainability of Soft Materials”.
- Dr. Willoughby is collaborating with the University of Sao Paulo: our investment in infrastructure in wet-spinning to create fibers from renewable biopolymers and their expertise and abundant sources of biopolymers sugar cane.
- Dr. Zhang creates lithium – ion batteries that far outperform current technology with more than 10 peer-reviewed articles to in the past year addressing this challenge.

4. **Enhance organizational excellence by creating a culture of constant improvement.**

- College programs are continuously revising undergraduate curricula and assessment activities to ensure quality instruction and student success.
- Our three UG degree programs have official Program Directors; faculty meet twice per month to review program progress and discuss opportunities for improvement.

5. **Enhance local and global engagement through focused strategic partnerships.**

- TECS is cultivating our strategic partnership with Donghua University in Shanghai: a reliable source of superior and highly motivated graduate students; a great partner institution. Also nurturing partnerships
with: the ACS, the AATCC, U of Calgary, the Center of Innovation of Nanobiotechnology, Fayetteville State, Georgia Tech, U of Graz, Illinois-Chicago School of Medicine, Istanbul Technical U, Johns Hopkins, Polish Academy of Sciences, Wake Forest, Yeungnam U, other departments across NC State, the UNC System and around the world.


- TPACC and the Nonwovens Institute have been strong, steady, long-lived and flourishing models for success in strategic partnerships both on-campus and off-campus.

- Dr. Hinks and the Forensic Sciences Institute has strong partnerships with the SBI, the CCBI, the National Institute of Justice, the NC Justice Academy, law enforcement and academic institutions and Dr. Hinks has been appointed to the NC Forensic Science Advisory Board.

- Dr. Pourdyhimi and the Nonwovens Cooperative Research Center have on-going partnerships with more than 70 consortia members. They are the most successful former IUCRC in history.
Key unit-level strategic priorities and short-term and long-term goals.

1. **Grow diversity among the faculty**
   - Create a task force to find ways to successfully hire more faculty who are female and/or from underrepresented groups.
   - Hire at least one faculty member during the 2012-2013 academic year.

2. **Expand faculty participation in our interdisciplinary centers and institutes: T-PACC and NCRC (and the NWI) and the FSI. Goals include:**
   - Hire a Co-Director for T-PACC to be in place in the Fall of 2012.
   - Facilitate the FSI faculty searches as needed.
   - Hire an analytical chemist to lead analytical activities in T-PACC and TECS.
   - Increase TECS faculty collaboration with these centers and institutes.

3. **Grow our Medical Textiles reputation and become the leading global academic partner in the application of innovative polymer and fiber-based solutions for healthcare.**
   - Finalize our Medical Textiles Scientific Advisory Board in summer 2012.
   - Hire a new faculty member in Regenerative Medicine: Chancellors Faculty Excellence.
   - Become partners on a major NIH grant in the next five years.

4. **Expand our composite materials success including nano-composites.**
   - Collaborate with ISE, MSE, MAE and industry in the Kinston Global Transpark.
   - Double our research funding in composites.
   - Continue investment in infrastructure and faculty.

5. **Revise the Textile Technology program.**
   - Align with industry in medical textiles, technical textiles and nonwovens.
   - Revise the curriculum to include topics focused on the design of Technical Textile products.
   - Partner with TechTextil to provide students with access to the International show.
6. Optimize admissions decisions to ensure consistent-sized high-quality undergraduate cohorts that match our classroom and laboratory facilities. Goals include:

- Three UG programs, each with a cohort of 30 – 35 students will ensure full use of our 35 seat classrooms. Two sections of laboratory per class section will maintain a safe laboratory environment with no more than 18 students per laboratory section.

- Growing the Textile Technology program, responding to needs of industry and students. Align with industry in technical textiles and nonwovens.

- Increase quality of incoming students with targeted recruitment; especially internal and external transfers and from Summer Textile Exploration Program and Polymer Day Camp.

**Barriers and critical issues keeping us from reaching our goals; investment priorities (in order)**

TECS faculty are among the most productive researchers at NC State and have high teaching loads relative to their peers. Investing in our faculty includes giving them more time to write proposals and carry out research by reducing their teaching load, providing laboratory technical personnel to manage the laboratory and facilitate data collection start-up projects. It also includes keeping our best at NC State through proactive retention efforts. TECS also proposes adding tenure-track faculty in a few key areas.

- Funding for 8 MS TAs, one PhD stipend and one post-doctoral scholar
  - 8 TECS TAs: TECS has never used TAs. Despite low salaries relative to our peer departments at NC State, we have very little funds for TAs. Nine graduate students volunteered to join the CoATs Program to earn a teaching certificate knowing it is unpaid. This is a travesty we cannot remedy with our budget.
  - one PhD student to manage the Medical Textiles laboratory while completing degree requirements.
  - one Post-Doctoral Scholar to manage the tri-component and wet-spinning areas and work with faculty across the college to generate income. This scholar would facilitate faculty in start-up projects, manage the lab, and perform TSAs as needed. As revenue is generated there would be an opportunity to advance to Research Assistant Professor.
TECS needs an Assistant Professor of analytical chemistry to lead our analytical laboratory and partner with T-PACC (MIST facility). TECS will target underrepresented groups.

Assistant Professor in the area of advanced systems and manufacturing analytics to integrate advanced analytics into supply chain and manufacturing processes which in today’s world are very complex and non-linear. Developing effective models and decision support systems is extremely important to improve advanced manufacturing excellence.

**Instructional Program Advances**

- A thorough review of the textile technology program is in progress with a curriculum action proposal expected in the Fall of 2012.
- The quality of the undergraduate programs has been demonstrated by three TECS undergraduate students having been selected for NSF Graduate Research Fellowships in the past year.
- The review of graduate programs during the 2011-2012 year was successful with many program strengths identified as well opportunities for improvement including the need for TA positions to offset the faculty teaching load.
Diversity: Initiatives and Progress

The TECS department is committed to nurturing a climate of appreciation of diversity in faculty, students and staff. We are working actively to recruit top graduate students from underrepresented groups and have worked with some success to create a more diverse faculty. Table 1 shows the composition of TECS faculty based upon gender and ethnicity. Although the TECS faculty is not as diverse in underrepresented groups as we would like to be, three of the five female faculty members were among our last eight faculty hires: 2003, 2006 and 2010. Still, Table 2 shows that our student demographic is approximately 45% female so increasing female representation in the faculty is an important goal. Those undergraduate students who identify as non-white (or international) represent 20% of our student body, not including TT or TEU students for whom we have no data. Clearly, TECS has an opportunity to improve the diversity of the faculty in terms of ethnicity and this is a goal.

Table 1. Composition of tenured / tenure-track faculty based upon gender and ethnicity.

<table>
<thead>
<tr>
<th>Faculty (Tenured / tenure-track)</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>African-American</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>White</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>5</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

Table 2. TECS totals, Fall 2011 by gender: UPA data not including TT or TEU students.

<table>
<thead>
<tr>
<th>Department / Level</th>
<th>Total</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>226</td>
<td>102</td>
<td>124</td>
</tr>
<tr>
<td>Graduate</td>
<td>44</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>270</strong></td>
<td><strong>122</strong></td>
<td><strong>148</strong></td>
</tr>
</tbody>
</table>

Table 3. TECS totals, Fall 2011 by ethnicity: UPA data not including TT or TEU students.

<table>
<thead>
<tr>
<th>Department / Level</th>
<th>Total</th>
<th>International</th>
<th>Unknown</th>
<th>Hispanic</th>
<th>Asian Amer</th>
<th>Black Afr Am</th>
<th>White</th>
<th>Two or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>242</td>
<td>1</td>
<td>8</td>
<td>11</td>
<td>13</td>
<td>22</td>
<td>184</td>
<td>3</td>
</tr>
<tr>
<td>Graduate</td>
<td>44</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>286</strong></td>
<td><strong>25</strong></td>
<td><strong>8</strong></td>
<td><strong>11</strong></td>
<td><strong>15</strong></td>
<td><strong>24</strong></td>
<td><strong>199</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>
Research Productivity and Scholarship

The data in Table 4 describes research activity in TECS during the 2011-2012 fiscal year. These data do not include contributions made by T-PACC or NCRC; both centers are extremely successful and run by TECS faculty. Research productivity was high while new research funding dropped significantly from previous years. Several grants were announced after April 30, the cut-off date for the data reported here so next year should be a nice rebound. The largest changes relative to the past several years are the number of manuscripts published (131) and new research dollars ($2,475,695). The number of manuscripts published in peer-reviewed journals was the highest level of productivity ever experienced from TECS faculty: 131 manuscripts were published from among the 156 authorships reported by the faculty (25 papers had more than one TECS co-author). This data is from the COT business office imported from RADAR. When faculty add in other proposals they claim were awarded but not found in RADAR, the numbers are much higher: $4,368,649. Clearly, the TECS faculty excel in generating research, education, and professional training contracts and grants.

Table 4. TECS Research Performance for 2011-12 cp. previous years

<table>
<thead>
<tr>
<th></th>
<th>2008-09</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
</tr>
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<tbody>
<tr>
<td>Refereed Publications</td>
<td>80</td>
<td>78</td>
<td>82</td>
<td>131</td>
</tr>
<tr>
<td>Non-Refereed Publications</td>
<td>18</td>
<td>4</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Publications In Press or Accepted</td>
<td>21</td>
<td>37</td>
<td>29</td>
<td>24</td>
</tr>
<tr>
<td>Publications Submitted</td>
<td>32</td>
<td>43</td>
<td>44</td>
<td>35</td>
</tr>
<tr>
<td>Book Chapters</td>
<td>14</td>
<td>9</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Books Written</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Books Edited</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Patents Issued</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Patent Disclosures</td>
<td>30</td>
<td>20</td>
<td>17</td>
<td>31</td>
</tr>
<tr>
<td>Total Presentations</td>
<td>141</td>
<td>150</td>
<td>199</td>
<td>105</td>
</tr>
<tr>
<td>Presentations at National Meetings</td>
<td>41</td>
<td>59</td>
<td>74</td>
<td>53</td>
</tr>
<tr>
<td>Presentations at International Meetings</td>
<td>59</td>
<td>43</td>
<td>77</td>
<td>32</td>
</tr>
<tr>
<td>New Research Dollars (K. Jordan)</td>
<td>$3,017,169</td>
<td>$4,103,291</td>
<td>$4,102,535</td>
<td>$2,475,695</td>
</tr>
<tr>
<td>TECS Research Expenditures (K. Jordan)</td>
<td>$1,392,450</td>
<td>$1,767,383</td>
<td>$2,375,471</td>
<td>$2,192,435</td>
</tr>
<tr>
<td>$ in Proposals Submitted (K. Jordan)</td>
<td>$35,599,315</td>
<td>$35,588,952</td>
<td>$60,307,888</td>
<td>$23,221,761</td>
</tr>
<tr>
<td>Proposals Submitted (K. Jordan)</td>
<td>130</td>
<td>54</td>
<td>79</td>
<td>72</td>
</tr>
<tr>
<td># Research Proposal Awards (K. Jordan)</td>
<td>23</td>
<td>33</td>
<td>33</td>
<td>29</td>
</tr>
</tbody>
</table>
Extension and Outreach

The College of Textiles has two outstanding Centers: TPACC and the NCRC. Both have directors (Behnam Pourdeyhimi and Roger Barker) that are TECS faculty. The NCRC has more than 70 paying industry members with on-going collaborations within NCRC. Although TPACC does not have industry membership, they serve industry and governmental agencies through services offered in thermal, chemical and biological protection, primarily for first responders. The faculty of TECS work regularly with industry partners. TECS faculty had research contracts in the 2011-2012 fiscal year from at least 12 private and public companies and even more governmental agencies from around the world.

Faculty and Staff: Honors, Awards and Recognition

Mr. Shawn Dunning (w/ Dr. Jon Rust): Gertrude Cox Award for Innovative Excellence in Teaching and Learning with Technology

Dr. Russell Gorga: Named to Editorial Board: Polymers

Dr. Peter Hauser: President of AATCC

Dr. David Hinks: Named Director of Graduate Programs and Associate Department Head, TECS

   Named Outstanding Teacher for the College of Textiles

Dr. Jeff Joines: Named Alumni Distinguished Undergraduate Professor

Dr. Jesse Jur: Named to Executive Committee, Thin Films Division in the American Vacuum Society

Dr. Stephen Michielsen: Named Director of Professional Development for Graduate Scholars, TECS

Dr. Renzo Shamey: Elected Chair of the National Color Measurement Test Methods Committee ‘11-’13

Dr. Melissa Pasquinelli: Promoted to Associate Professor with tenure

   College of Textiles nomination for Board of Governors Award
   Chair-elect for NC Section of the American Chemical Society
   Appointed to ACS National Committee of Environmental Improvement, Assoc. member.

Dr. Xiangwu Zhang: Editorial board: International Journal of Nano Science, Nano Engineering and Nanotechnology
Students: Honors, Measures of Quality and Student Activities

Undergraduate placement rates remain high: approximately 90% for the department overall. Starting salaries remain high: averages for the individual programs between $45,000 and $50,000. The review of graduate programs was successful. Graduation rates remain high for the department with most students graduating in fewer than 5 years. Three TECS graduates in the past 12 months have received NSF Graduate Research Fellowships. Some recent awards include:

Daniel Ajure: 2011 APICS Student Scholarship Award (Dr. Hodge)

J. Joyner, K. Henry and D. Bolds: Best Poster Award at University of Nebraska Conference for UG Women in Physics, “Materials Girls” (Drs. Gorga and Willoughby)


Rashi Grewal: Awarded an all-inclusive EDANA student travel grant to present her research at the Nonwovens Research Academy in Gothenberg Sweden (Dr. Willoughby)

Nagarajan (Nags) Thoppey Muthuraman: Selected to present at ACS Division of Polymers “Excellence in Graduate Polymer Research Symposium” (Dr. Gorga)

Joseph Moo Young: Freshman student in Textile Engineering (Dr. Pasquinelli) was
  o NC State representative at the ACC Meeting the Minds Conference, Blacksburg VA
  o Superior Rating and Medal at Nat'l Sigma Xi Student Res. Conf. poster presentation

Kelly Stano: Awarded a 2011 NSF Graduate Research Fellowship

Yongxin Wang: Runner-up student poster competition at Chemical and Biological Defense Science and Technology Conference

Fund-Raising Successes

Hanesbrands Strategic Partnership led by Dr. Jeff Joines:
  - $1,000,000 over five years to support Senior Design projects, graduate students, laboratory use
  - Hanesbrands will be recruiting our students for intern work at the college and full-time employment upon graduation
  - Hanesbrands will have full time employees working here at the college
Recommendations and Concerns

TECS has grown undergraduate enrollment while maintaining very high placement rates and starting salaries for the graduates. TECS has grown graduate enrollment despite a large budget giveback that severely reduced our ability to recruit by offering graduate stipends. TECS has grown research funding with assistance from the university in renovating aging facilities. TECS faculty can continue to grow research funding while maintaining the excellent environment for teaching and learning.

TECS faculty are among the most productive researchers at NC State and have higher teaching loads than their peers. Invest in our faculty, by giving them more time to write proposals and carry out research. This includes providing MS TAs to relieve the most productive faculty of a portion of their teaching commitment, providing post-doctoral scholars to facilitate faculty in the medical textiles and extrusion areas. This can be through assisting directly with research activities, working to generate funding through TSAs and sponsored grants, and working to generate data to facilitate the proposal writing process.

The TECS faculty comprise a large group in the age range where retirement is approaching. We have a few key areas that must not face a gap in leadership and therefore we need to invest in highly productive faculty in specific high-growth areas. Additionally, TECS faculty salaries are low relative to our peer groups across the NC State campus. Investing in our faculty includes keeping our best through proactive retention efforts.
Appendix A

Publications and Presentations

Refereed Publications: 131 (156 less 25 with TECS co-authors)


Lu Lihua; He Liang; Zhang Shufen; Freeman, Harold, “Novel yellow azo-anthraquinone dyes for polylactide fibres: effects of alkyl chain length”, COLORATION TECHNOLOGY, 128(2), 121-126 (Feb, 2012).


Sara A. Arvidson, Ka C. Wong, Russell E. Gorga, and Saad A. Khan, "Structure, Molecular Orientation, and Resultant Mechanical Properties in Core/Sheath Poly(lactic acid)/Polypropylene Composites" Polymer 53(3) 791-800 (2012)


S. Ramaswamy, L.I. Clarke, and R. E. Gorga, “Morphological, mechanical, and electrical properties as a function of thermal bonding in electrospun nanocomposites” Polymer, 52(14) 3183-3189 (2011)

Yingfang Yao, Zhan Lin, Ying Li, Mataz Alcoutlabi, Hechmi Hamouda, Xiangwu Zhang, Superacidic Electrospun Fiber-Nafion Hybrid Proton Exchange Membranes, Advanced Energy Material, 1, (2011) 1133–1140


David Hinks and Renzo Shamey, Review of Retail Store Lighting: Implications for Colour Control of Products, Coloration Technology, 127(2) 2011, 121-128.


Hassan Chaudhry, George Hodge, (2012) "Postponement and supply chain structure: cases from the textile and apparel industry", Journal of Fashion Marketing and Management, Vol. 16 Iss: 1, pp.64 - 80


Moataz Bella M. Mousa, Christopher J. Oldham, Jesse S. Jur and Gregory N. Parsons, "Effect of Temperature and Gas Velocity on Growth per Cycle during Al₂O₃ and ZnO ALD at Atmospheric Pressure”, Journal of Vacuum Science and Technology A 30 (1) 01A155 (2012).


Bo Gong, Qing Peng, Jesse S. Jur, Christina K. Devine, Kyoungmi Lee and Gregory N Parsons “Sequential Vapor Infiltration of Metal Oxides into Sacrificial Polyester Fibers: Shape Replication and Controlled Porosity of Micro/Mesoporous Oxide Monoliths” Chemistry of Materials 23 (15) 3476-3485 (2011).


Chung Sangwon, Martin W. King. Design concepts and strategies for tissue engineering scaffolds, Biotechnology and Applied Biochemistry, 58:6, 423-438 (2011)

Chen Ying, Xin Ding, Yuling Li, Martin W. King, Jie Gao and Xueqian Zhao. A bilayer prototype woven vascular prosthesis with improved radial compliance. Journal of the Textile Institute 103:1, 106-111 (2012)


Liu, HY, Li, Y, Krause, WE, Pasquinelli, MA, Rojas, OJ, "Mesoscopic Simulations of the Phase Behavior of Aqueous EO19PO29EO19 Solutions Confined and Sheared by Hydrophobic and Hydrophilic Surfaces", ACS APPLIED MATERIALS & INTERFACES Volume: 4 Issue: 1 Pages: 87-95


M. Dasdamir, B. Maze, and B. Pourdeyhimi, "Influence of Polymer Type, Composition and Interface on the Structural and Mechanical Properties of Core/Sheath Type Bicomponent Nonwoven Fibers", Journal of Materials Science, In Press.


Yuehui Yin, Mingxia Gao, Hongge Pan, Lukai Shen, Xin Ye, Yongfeng Liu, Peter S. Fedkiw, and Xiangwu Zhang, “High-Rate Capability of LiFePO4 Cathode Materials Containing Fe2P and Trace Carbon”, Journal of Power Sources, 199, 256-262 (2012).


Bingkun Guo, Ying Li, Yingfang Yao, Zhan Lin, Liwen Ji, Guanjie Xu, Yinzheng Liang, Quan Shi, and Xiangwu Zhang, “Electros spun Li4Ti5O12/C Composites for Lithium-Ion Batteries with High Rate Performance”, Solid State Ionics, 204-205, 61-65 (2011).


Non Refereed Publications: 17


In-Press or Accepted Publications: 24


Renzo Shamey, Reid Clonts, David Hinks, The Effect of Hue on the Perception of Blackness Using Munsell Samples, Color Research and Application, Accepted


M. Dasdamir, B. Maze, and B. Pourdeyhimi, "Influence of Polymer Type, Composition and Interface on the Structural and Mechanical Properties of Core/Sheath Type Bicomponent Nonwoven Fibers", Journal of Materials Science, In Press.

Shamey R*, Clonts Haslup RJ, Perception and Quantification of Blackness, Vision Research, (2012) (Accepted, revision)


Shu Zhang, Ying Li, Guanjie Xu, Shuli Li, Yao Lu, Ozan Toprakci, and Xiangwu Zhang, "High-Capacity Li$_{2}$Mn$_{0.8}$Fe$_{0.2}$SiO$_{4}$/Carbon Composite Nanofiber Cathodes for Lithium-Ion Batteries", accepted by Journal of Power Sources, March 2012.


Liu, L., Seyam, A.M., and Oxenham, W., ”Frictional Electrification on Polymeric Flat Surfaces”, Submitted to Journal of Engineered Fibers and Fabrics, Final Acceptance 03/09/2012

Submitted for Publication: 35


Alexandra B. Ormond and Harold S. Freeman, Effects of Substituents on the Photophysical Properties of Symmetrical Porphyrins, Dyes and Pigments, April 2012


Min Li and David Hinks, One Bath Desizing, Scouring and Activated Bleaching: An Environmentally Benign Approach to Cotton Preparation, AATCC Review, March 26, 2012


Samberg, Meghan E., Peter Mente, Ting He, Martin W. King, Nancy Monteiro-Riviere, Incorporation of silver nanoparticles into a degradable poly(lactide-co-caprolactone) copolymer scaffold for skin growth. Biomaterials


Leigang Xue, Shu Zhang, Yao Lu, Ozan Toprakci, Mataz Alcoutlabi, Hun Lee, Quan Shi, Xiangwu Zhang, “High Capacity and Durable 0.3Li₂MnO₃·0.5LiMn₀.₅Ni₀.₅O₂·0.2LiCoO₂ Cathode Material Prepared By Co-Precipitation Method”, Submitted to Electrochemistry Communications, April 2012.

Leigang Xue, Guanjie Xu, Ying Li, Kun Fu, Shuli Li, Quan Shi, and Xiangwu Zhang, “Carbon-Coated Si Nanoparticles Dispersed in Carbon Nanotube Networks as Anode Material for Lithium Ion Batteries”, submitted to Energy & Environmental Science, March 2012.


Shu Zhang, Zhan Lin, Liwen Ji, Ying Li, Guanjie Xu, Shuli Li, Yao Lu, and Xiangwu Zhang, “Cr-Doped Li₂MnSiO₃/Carbon Composite Nanofibers as High-Energy Cathodes for Li-Ion Batteries”, submitted to Advanced Functional Materials, March 2012.


Shu Zhang, Ying Li, Guanjie Xu, Shuli Li, Yao Lu, Ozan Toprakci, and Xiangwu Zhang, “Li₂MnSiO₄/Carbon Composite Nanofibers as High-Capacity Cathode Materials for Li-ion Batteries”, submitted to Soft Nanoscience Letters, March 2012.

Liwen Ji, Ozan Toprakci, Mataz Alcoutlabi, Yingfang Yao, Ying Li, Shu Zhang, Bingkun Guo, Zhan Lin, and Xiangwu Zhang, "Iron Oxide-Loaded Carbon Nanofibers as Stable and High Capacity Anodes for Rechargeable Li-Ion Batteries", Submitted to ACS Applied Materials and Interfaces, February 2012.


Book Chapters Written: 13


MA Pasquinelli and Y Yingling, "Molecular dynamics simulations of bio-nano interactions", in Molecular Modeling and Its Role in Advancing Nanotechnology, Encyclopedia of Nanotechnology, Springer, in press


Books Edited: 3


Books Written: 8


Wang, Lu, Martin W. King, "Biomedical Textiles", China Textile Press, Beijing, P.R.China (In Press)


Patents Issued: 15


Light Activated Antiviral Materials and Devices and Methods for Decontaminating Virus Infected Environments, Michielsen, Stephen, Churchward, Gordon; Bozja, Jadranka; Stojilkovic, Igor, P-No 146398 (Singapore), issued 14 October 2011.


B. Pourdeyhimi, Mixed Fiber and Nonwoven Fabrics Made from the Same, European Patent 2,179,081, November 2, 2011.


Patents Filed: 6

33
Ahmed El-Shafei, U.S. Provisional Patent Applications No. 61/539,068, was filed in September 2011 covering the technology of NCSU-10 and related congeners

Gregory N. Parsons, Christopher J. Oldham, Jesse S. Jur, Moataz Bellah Mousa, March 20th, 2012 “Methods and Apparatus for Atmospheric Pressure Atomic Layer Deposition” U.S. Provisional Patent Application Serial No. 61/613,326


5051.811.PR Richard H. Guenther, Julie Willoughby, Steven A. Lommel, 4/16/2012, NANOTECHNOLOGY SYSTEM FOR AGRICULTURAL APPLICATIONS


**Patents Disclosed: 25**

Ahmed El-Shafei, Maryam Mazloumpour, and Peter Hauser, Plasma-induced Graft Polymerization of Quaternary Monomers on Nonwovens Polypropylene for Antimicrobial Properties.

Peter Hauser, Priyadarshini Malshe, Ahmed El-Shafei, Dual Functional Textile

Ahmed El-Shafei, Molecular Engineering and Synthesis of a Novel Generation of More Stable and Higher Efficient Dyes for Dye-sensitized Solar Cells

Highly Anisotropic Dielectric Elastomer Composite, Krishna Bala Subramani, Richard Spontak, Tushar K. Ghosh, NCSU invention Disclosure 12104, Submitted November 2011

Mobile Charcoal and Biochar Hut, Christopher B. Hopkins, Tushar. K. Ghosh, NCSU Invention Disclosure No. 12194, Submitted November 2011

Matthew Farrell and Peter Hauser, 11/21/2011, Dye Retarder/Leveler for Anionic Dyes Applied to Cationized Cotton

Matthew Farrell and Peter Hauser, 11/21/2011, Pad Bake Cationization of Cellulose

Peter Hauser, Priyadarshini Malshe, and Ahmed El-Shafei, 12/15/2011, Dual Functional Textile


Plasma Textile as an Advanced Filtration and Decontamination Material, W. Jasper, A. Saveliev, I. Kuznetsov, A.V. Kuznetsov, 9/6/2011 NCSU File # 12017

Plasma cardboard as an advanced contamination prevention and decontamination material, J. Levine, A. Saveliev, A. Kuznetsov, W. Jasper, I. Kuznetsov, 12/1/2011, File # 12113


12-088 “Methods and Apparatus for Atmospheric Pressure Atomic Layer Deposition” Gregory N. Parsons, Christopher J. Oldham, Jesse S. Jur, Moataz Bellah Mousa, March 2012

Martin W. King, Ahmed El-Shafei, Nisarg Tambe, Surface bioactivation of poly(lactic acid) fibers for use as tissue engineering scaffolds. December 19, 2011.


R. Kotek, H. Yoon, December 16, 2011, "Advanced one-step melt-spinning process of high performance filament(s) by utilizing a horizontal isothermal bath (HIB)", No. 12154.


SS Tallury, MA Pasquinelli, B Pourdeyhimi, and R Spontak, "Bicomponent Fibers Capable of Thermally Induced Shape Recovery After Low-Temperature Strain Fixing". 4 November 2011, NCSU file 12084

Julie Willoughby, Russell Gorga, Jan Genzer; September 9, 2011; Latent Heat Storage via a Silicone-based Fiber and Polymer Platform


Xiangwu Zhang, Marian G. McCord, Mohamed A. Bourham, Quan Shi, Joshua Nowak, and Narendiran Vitchuli Gangadhar, "Atmospheric Pressure Plasma-Melt Blowing Hybrid Process for Producing Durable and High Performance Nanofibers and Nanofiber Mats", NCSU Invention Disclosure No. 12020, August 2011.

International Presentations and/or Conferences: 32


C. Gardner, R. E. Gorga, Yeoheung Yun, Jag Sankar, “Analysis of Electrospun Nanofiber PLA Coating for Biodegradable Magnesium Implants”, Nanofibers for the Third Millenium, August 2011, Raleigh, NC.


“Sustainable Cotton Dyeing”, International Conference on Eco-Dyeing/Finishing and Green Chemistry, Hangzhou, China, June 8-11, 2011 Peter Hauser (invited presentation and plenary speaker)
“The Effects of QAC Antimicrobials on the Rehabilitation Performance of Burn Pressure Garments”, International Congress of Innovative Textiles, Istanbul, Turkey, October 20-22, 2011 Nilufer Varan, Martin King, Peter Hauser

“Towards Low Environmental Impact Preparation of Cotton”,Changhai Xu, David Hinks, Min Li, Ahmed El-Shafei, Peter Hauser, Mary Ankeny, Kaitlyn Lee, 11th Asian Textile Conference, Daegu, Korea, November 1-4, 2011

David Hinks, Forensic Sciences Institute and The Growing Web of Textiles, Dankook University, October 31, 2011.

David Hinks, Forensic Sciences Institute and The Growing Web of Textiles, Seoul National University, November 4, 2011.

Changhai Xu, David Hinks, Min Li, Ahmed El-Shafei, Mary Ankeny, Katelyn Lee, Towards Low Environmental Impact Preparation of Cotton, 2011 Asian Textile Conference, Daegu, Korea, November 1-4, 2011

Min Li (Advisor: David Hinks), One Bath Desizing, Scouring and Activated Bleaching: An Environmentally Benign Approach to Cotton Preparation, AATCC International Conference, March 22, 2012

Min Li, Changhai Xu, David Hinks, Mary Ankeny, Katelyn Lee, Combining Cationic Bleach Activator with Enzymes in Cotton Preparation, Novozymes, Beijing, China, 5/26/2011

David Hinks (Keynote), Bleach Activators for Environmentally Efficient Bleaching of Textiles, 2011 Textile Bioengineering and Informatics Symposium, Beijing, China, 5/27-29/2011

Iuri Sas, J.A. Joines and K Thoney, "Simulation of Closed Loop Reverse Logistic Systems, Winter Simulation Conference Poster


MA Pasquinelli, “Characteristics of Textiles via Multiscale Modeling from the Nanoscale”, Kazan State University (site visit), Raleigh, NC (10 November 2011)

J Moo-Young and MA Pasquinelli, “Molecular Dynamics Simulations of Carbon Nanotube-Polythiophene Interactions”, Sigma Xi International Conference, Raleigh, NC (12 November 2011).


“Restructuring Polymers via Nano-Confinement and Subsequent Release”, Institute of Chemistry Chinese Academy of Sciences, Beijing, 5/4/2012 and 16th International Cyclodextrin Symposium, Nanki University, Tianjin, 5/9/2012. Invited, and Plenary Talks (Multiple grad. students)


Office of Naval Research Annual Solid Mechanics Program Review Meeting, Adelphi, MD, 12-14 September, 2011

Regional/National Presentations and/or Conferences: 53

Factors Influencing the Uptake Rate of Passive Adsorbent Dosimeters Used in the Man-In-Simulant-Test. R. Bryan Ormond, Roger Barker, Keith Beck, Donald Thompson, and Shawn Deaton, NIST Meeting


David Hinks, Keith Beck, Anne Fraser, Chuanzhen Zhou, Roberto Garcia, and Dieter Griffis, Advancing Forensic Fiber and Dye Analysis, NC Criminal Information Exchange (CIX) 67th Law Enforcement Conference, Carolina Beach, North Carolina, October 3, 2011.


David Hinks, Keith Beck, Anne Fraser, Chuanzhen Zhou, Min Li, Roberto Garcia, and Dieter Griffis, Advancing Trace Evidence Analysis of Dyed Fibers: New Methods to Unambiguously Identify Dyes, UC Davis Forensic Science Seminar, Tahoe City, CA, May 4-6, 2012


S.A. Arvidson, K.E. Roskov, R.J. Spontak, S.A. Khan, R.E. Gorga. “Compatibilization of PLA/PP core/sheath fibers.” American Institute of Chemical Engineers, Annual Meeting, November 2011, Minneapolis, MN


David Hinks, Keith Beck, Anne Fraser, Chuanzhen Zhou, Min Li, Roberto Garcia, and Dieter Griffis, Advancing Trace Evidence Analysis of Dye in Dye, UC Davis Forensic Science Seminar, Tahoe City, May 4-6, 2012


David Hinks, Keith Beck, Anne Fraser, Chuanzhen Zhou, Roberto Garcia, and Dieter Griffis, Advancing Forensic Fiber and Dye Analysis, NC Criminal Information Exchange (CIX) 67th Law Enforcement Conference, Carolina Beach, North Carolina, October 3, 2011.


David Hinks, Renzo Shamey, Juan Lin, Changhui Xu, Lina Cardenas, Reid Clonts, Gang Fang, Whiteness and Color Difference Perception: Key Variables and Recent Advances in Measurement and Modeling, Proctor and Gamble, Cincinatti, Ohio, March 15, 2012

David Hinks, Keith Beck, Anne Fraser, Chuanzhen Zhou, Min Li, Roberto Garcia and Dieter Griffis, New Approaches to the Unambiguous Identification of Dyes in Dyed Fibers, Proctor and Gamble, Cincinatti, Ohio, March 15, 2012


(invited) Mir A Quddus, Orlando J Rojas, and Melissa A. Pasquinelli, "Molecular dynamics simulations of the thermal stability of oleic acid films on a crystalline cellulose surface", CELL Division, ACS Spring National Meeting, San Diego, CA (March 26, 2012)

Alper Gurarslan, Melissa A Pasquinelli, and Al Tonelli, “Comparative threading of guest polymers by host cyclodextrins: Modeling and experimental observations”, POLY Division, ACS Spring National Meeting, San Diego, CA (March 27, 2012)

Joseph Moo Young and Melissa A. Pasquinelli, "Molecular Dynamics Simulations of Carbon Nanotube-Polythiophene Interactions", Virginia Tech/ACC Meeting of the Minds (March 31, 2012)

MA Pasquinelli, "Investigation of the Properties of Polymeric Materials via Multiscale Modeling Simulations from the Nanoscale", Air Force Research Laboratory, Wright Patterson Air Force Base, 2 May 2012


"Examining the “Forest” to see the “Trees”: The Kerr-Effect and Polymer Microstructures”, S. Hardrict, R. Gurarslan, C. Galvin, B. Sumerlin, A. E. Tonelli, Fall ACS Meeting, Denver, 8/28/2012. Invited Talk (1 Post-Doc, 2 grad. Students)

"Improving the processibility of Poly(thiophenes) with Cyclodextrins”, G. J. Anthony, A. E. Tonelli, Fall ACS Meeting, Denver, 8/29/2012. Poster (1 grad. Student)

"Self-Reinforced Polymer Composites”, A. Gurarslan, A. E. Tonelli, Fall ACS Meeting, Denver, 8/29/2012. Invited Talk (1 grad. Student)

"Improving the Properties and Recycling of PET”, A. S. Joijode, A. E. Tonelli, Fall ACS Meeting, Denver, 8/30/2012. Invited Talk (1 grad. Student)

Comparative threading of Guest Polymers by Host Cyclodextrins, A. Gurarslan, M. Pasquinelli, A. E. Tonelli, NC-ACS Section Meeting, COT, 9/30/2011. Poster (1 grad. Student)

“Annealing Studies of Poly(vinyl acetate) Coalesced from its Inclusion Complex with Cyclodextrin”, A. S. Joijode, A. E. Tonelli, NC-ACS Section Meeting, COT, 9/30/2011. Poster 1 grad. Student)


“Nano-structuring Polymers with cyclodextrins”, A. S. Joijode, A. E. Tonelli, Polymer nano- Composites- SPE-2012, 3/6/2012, Lehigh University, PA, Poster (3rd Place winner), (1 grad. Student)

“Characterization of Polymers with the Kerr-Effect: Can we learn about the Trees through examination of the Forest”, R. Gurarslan, A. E. Tonelli, ACS Spring Meeting, San Diego, 3/26/2012


Xiangwu Zhang, “Nanofiber Anodes, Cathodes and Separators for Lithium-Ion Batteries”, Oak Ridge National Laboratory, Oak Ridge, Tennessee, March 2012. (Invited)


Ozan Toprakci, Shu Zhang, Guanjie Xu, Ying Li, and Xiangwu Zhang, “Fabrication and Electrochemical Characteristics of Electrospun LiFePO4/Carbon+Graphene Composite Nanofibers for Lithium-Ion Batteries”, 2011 MRS Fall Meeting & Exhibit, Boston, MA, November 2011.

Guanjie Xu, Ying Li, Ozan Toprakci, Shu Zhang, and Xiangwu Zhang, “MnOx/Carbon Composite Nanofiber Cathodes for Rechargeable Li/Air Batteries”, *2011 MRS Fall Meeting & Exhibit*, Boston, MA, November 2011.

Mataz Alcoutlabi, Liwen Ji, Ying Li, Shu Zhang, Ozan Toprakci, and Xiangwu Zhang, “Recent Developments in Nanostructured Anode and Cathode Materials for Rechargeable Lithium-Ion Batteries”, *2011 MRS Fall Meeting & Exhibit*, Boston, MA, November 2011


Group visit to NASA Langley Research Center and National Institute of Aerospace, Hampton, VA, November 10, 2011

**SAMPE Carolinas Meeting, Charlotte, NC, September 20, 2011**

**Local (Triangle) Presentations: 20**


Singh, SA, J. A. Joines, "Simulation Analysis of the PACU at Duke Hospital", UG Research Symposium


Alper Gurarslan, Melissa A Pasquinelli, and Al Tonelli, "Competitive threading of guest polymers by host cyclodextrins: Modeling and experimental observations", NC-ACS Local Section Meeting (Sept. 2011)

MA Pasquinelli, "Multiscale Modeling of Soft Materials in the College of Textiles," Eastman Chemical visit, 8 December 2011


Alper Gurarslan, Melissa A Pasquinelli, and Al Tonelli, "Competitive threading of guest polymers by host cyclodextrins: Modeling and experimantal observations", NC State Graduate Research Symposium (March 20, 2012)

Joseph Moo Young and Melissa A. Pasquinelli, "Molecular Dynamics Simulations of Carbon Nanotube-Polythiophene Interactions", NCSU Undergraduate Research Symposium (April 10, 2012)

"Formation, behavior, and properties of Self-nucleated PET: 2 year study", K. Hawkins (Enloe HS), A. S. Joijode, A. E. Tonelli, NCSU Undergraduate Research Symposium, McKimmon Center 8/3/2-11,and NC-ACS Section Meeting 9/30/2011, COT. Poster (1 HS, 1 grad. Student)


Xiangwu Zhang, "Carbon Fibers and Nanofibers ", to Pardale Mills, Raleigh, March 2012.

Ying Li, and Xiangwu Zhang, 'Improve the Cyclic Stability of Si/C Nanofiber Composite Anodes for New-Generation Rechargeable Lithium-Ion Batteries", the Seventh Annual NC State University Graduate Student Research Symposium, Raleigh, March 2012.


Mai-Hsuan Sabrina Huang, Guanjie Xu and Xiangwu Zhang, Carbon Nanofiber/Manganese Oxide Composites as the Cathode for Li-air Batteries, NC State Undergraduate Research Summer Symposium, Raleigh, NC, August 2011.
## Appendix B

### Active Research Projects

**Research Projects:** 89

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Principal Investigator</th>
<th>Collaborating Agency/Department</th>
<th>Funding</th>
<th>Start Date to End Date</th>
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<tbody>
<tr>
<td><strong>Flash Fire CBRN Boot</strong></td>
<td>Roger L. Barker</td>
<td>US Army (RDECOM)</td>
<td>$886,609.00</td>
<td>2/20/2009 to 6/30/2012</td>
</tr>
<tr>
<td><strong>Second Generation Manikin for Chemical and Biological Protection Research</strong></td>
<td>Roger L. Barker</td>
<td>US Army - Research, Development and Engineering Command (RDECOM)</td>
<td>$796,000.00</td>
<td>9/20/2010 to 12/31/2011</td>
</tr>
<tr>
<td><strong>New Real-Time Man-In-Simulant Test Sensor and Method</strong></td>
<td>Roger Barker</td>
<td>Combating Terrorism Technology Support Office (CTTSO)</td>
<td>$557,015.00</td>
<td>2/24/2012 to 8/23/2013</td>
</tr>
<tr>
<td><strong>IC-CRIME: Interdisciplinary Cyber-Enabled Crime Reconstruction through Innovative Methodology and Engagement</strong></td>
<td>Keith R. Beck, Timothy W Buie, David Hinks, Mitzi M. Montoya-Weiss, R. M. Young</td>
<td></td>
<td>$1,400,000.00</td>
<td>9/1/2009 to 8/31/2012</td>
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<tr>
<td><strong>A Micro-Fluidic Device for Extracting and Identifying Dyes from Small Fiber Samples for Forensic Purposes</strong></td>
<td>Keith R. Beck, Thomas A. Dow, Kenneth P. Garrard, David Hinks, David C. Muddiman, Alexander Sohn</td>
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42
Nanofiber Surface Treatment on Microfibers to Increase Nonwoven Filtration Efficiency
Philip David Bradford
$30,480.00
9/1/2010 to 8/31/2011

Investigation of a Novel Silicon/Carbon Nanotube 3-D Nanoarchitecture for Binder-Free, Stable Capacity, Lithium-Ion Battery Anodes
Philip David Bradford
$6,000.00
7/1/2011 to 6/30/2012

Multifunctional Shear Pressed CNT Sheets for Strain Sensing and Composite Joint Toughening
Alexander Bogdanovich, Philip Bradford
AFOSR
$100,000.00
9/1/2011 to 8/31/2013

Bonding Unidirectional Carbon Nanotube with Carbon for High Performance, Low Density Composites
Yuntian Zhu, Philip Bradford
AFOSR
$124,996.00
4/1/2012 to 3/31/2015

Unitized Composite Airframe Structures with Three Dimensional (3-D) Preforms for Elevated Temperature Applications
Alex Bogdanovich, Philip Bradford
Performance Polymer Solutions
$188,911.00
3/15/2012 to 3/14/2015

Durable Antistatic Finishes via Plasma Aided Electroless Deposition
Ahmed M El-Shafei, Peter J. Hauser
$151,882.00
1/15/2012 to 1/16/2014

Plasma Treatment of Cotton Fabrics for Sustainable Finishing Applications
Ahmed M El-Shafei, Peter J. Hauser
Cotton, Inc.
$77,638.00
1/1/2011 to 12/31/2011

Plasma Treatment of Cotton Fabrics for Sustainable Finishing Applications
Ahmed El-Shafei and Peter Hauser
Cotton, Inc.
$52,163.00
1/1/2012 to 12/1/2012

Synthesis and analysis of NIR absorbing dyes
Harold Freeman
United Color Manufacturing
$33,100.00
10/5/2011 to
Evaluation of dyed PET films
Harold Freeman, Keith Beck
Saint-Gobain Solar Gard
$21,975.00
10/10/2011 to

Method for decolorization of nylon yarn fluff
Harold Freeman and David Hinks
Applied Thermoplastics
$25,000.00
2/1/2012 to

A Mechanistic Understanding of the Process-Property Relationships in an Alternative Electrospinning Process
Laura I. Clarke, Russell E. Gorga
00001
$389,189.00
8/1/2008 to 7/31/2011

A Mechanistic Understanding of the Process-Property Relationships in an Alternative Electrospinning Process
Laura I. Clarke, Russell E. Gorga
00001
$12,000.00
8/1/2008 to 7/31/2011

Utilizing the Photothermal Effect of Metal Nanoparticles for Processing of Polymers
Jason Russell Bochinski, Laura I. Clarke, Russell E. Gorga
00001
$481,596.00
5/1/2011 to 4/30/2014

Utilizing the Photothermal Effect of Metal Nanoparticles for Processing of Polymers
Jason Russell Bochinski, Laura I. Clarke, Russell E. Gorga
00001
$6,000.00
5/1/2011 to 4/30/2014

Sustainable Cotton Dyeing
Peter J. Hauser, David Hinks
00002
$46,099.00
1/1/2011 to 12/31/2011

Tobacco Based Dyes: Isolation, Characterization, and Application to Textiles (Phase I)
Keith R. Beck, Harold S. Freeman, Peter J. Hauser
00002
$135,448.00
6/5/2011 to 6/5/2012

Vapor Surface Modification of Nonwovens
Jesse Jur, Peter Hauser
NCRC 11-134
7/1/2012 to 8/30/2013
Project well underway

Keith R. Beck, Dieter P. Griffis, David Hinks
00001
$619,141.00
1/1/2010 to 12/31/2012

Development of Imaging Methodology for the Assessment of Camouflage Substrates (IMACS) via Instrumental and Visual Color Assessment of Universal Camouflage Pattern
David Hinks, Renzo Shamey
00430
$281,437.00
7/1/2010 to 6/30/2011

Infrastructure for Establishment of the North Carolina Forensic Sciences Institute
David Hinks, Ann H. Ross, David W. Watson
00001
$175,000.00
10/1/2010 to 9/30/2011

Optimization of a Benign Cotton Bleaching Process Using a Novel Cationic Bleach Activator
Ahmed M El-Shafei, David Hinks, Changhai Xu
00002
$27,989.00
1/1/2011 to 12/31/2011

Microfluidic System for Automated Dye Molecule Extraction and Detection for Forensic Fiber Identification
Thomas A. Dow, David Hinks
00001
$537,098.00
10/1/2011 to 9/30/2013

Colorant Database for Cationized Cotton
Peter J. Hauser, David Hinks
00002
$6,887.00
10/1/2011 to 12/31/2011

Logistics of Closed Loop Textile Recycling: 2nd Year
Jeffrey A. Joines, Russell E. King, Kristin A. Thoney-Barletta
NCSU National Textile Center Program
$69,999.00
5/1/2010 to 4/30/2011

Continuous Atmospheric Pressure Atomic Layer Deposition Process for Controlled Nanoscale Thin Film Coatings
Jesse Jur, Gregory N. Parsons
00001
$372,001.00
6/1/2010 to 5/31/2013

Inorganic/Organic Hybrid Processes for Nonwovens
Jesse Jur
00005
$7,500.00
1/1/2011 to 12/31/2011

Thin Films for Barrier Layer Protection of Printed Circuit Board Substrates
Jesse Jur
00001
$20,000.00  
3/28/2011 to 9/30/2011

**Thin Films for Barrier Layer Protection of Printed Circuit Board Substrates**  
Jesse Jur  
00001  
$10,000.00  
3/28/2011 to 9/30/2012

**Photovoltaic Designs on Textile Platforms**  
Jesse Jur  
00005  
$6,000.00  
7/1/2011 to 6/30/2012

**Chancellor's Innovation Fund - Nanoscale Finishes for UV Protection of Textiles**  
Jesse Jur, Gregory N. Parsons  
00005  
$75,000.00  
7/1/2011 to 6/30/2012

**Multifunctional Sustainable Nonwovens**  
Jesse S. Jur, Gregory N. Parsons, Peter Hauser and Behnam Pourdeyhimi  
Nonwoven Cooperative Research Center  
$143,747.00  
7/1/2011 to 6/30/2013

**Fabrication and Modeling of Conductive Nonwovens**  
Gregory N. Parsons, Jesse S. Jur, Benoit Maze, and Behnam Pourdeyhimi  
Nonwoven Cooperative Research Center  
$90,000.00

**Multi-Function, Conformal, Textile Antenna For Unmanned Aerial Vehicles**  
Jesse S. Jur and Behnam Pourdeyhimi  
Subcontract to PSI Corp.  
$40,000.00  
3/1/2012 to 11/30/2012

**Novel 3-Dimensional Nanofibrous Extra Cellular Matrix for Generation of Functioning Neo-Ilets.**  
Martin W. KING, in collaboration with Dr. David GERBER, Chief of Transplantation Surgery, UNC - Chapel Hill  
NC TraCS, UNC - Chapel Hill  
$10,000.00  
6/1/2010 to 8/31/2011

**Development of Abrasion Test between Endovascular Graft and Stent Materials**  
Martin W. KING  
Cook Medical Inc.  
$69,315.00  
6/17/2011 to 6/16/2012

**Modeling to Predict Fluid Flow and Strength Loss of Resorbable Fibrous Polymers**  
Martin W. KING  
Tengion Inc.  
$25,000.00  
8/15/2011 to 5/15/2012

**Review of Fiber-forming Resorbable Polymers**  
Martin W. KING  
Atex Technologies Inc.
New Blood Vessel Regeneration using Small Diameter Vascular Grafts
Martin W. KING and Professor Lu WANG
Shanghai Municipal Government, Science & Technology Committee
$75,000 (Y471,600)
1/1/2009 to 12/31/2011

Fatigue Testing of RF Punctured and Fenestrated Stent-Grafts Deployed in Phantom Aneurysms
Martin W. KING, Leonard TSE (University of Toronto) and Gilles SOULEZ (University of Montreal)
Ontario Centre for Excellence, Toronto, Canada
Cdn$35,000
6/15/2010 to 12/15/2011

Surface Engineered Vascular Prostheses with Improved Long-term Biocompatibility
Song LIU and Martin W. KING
Canadian Foundation for Innovation, Ottawa, Canada
Cdn$98,430
1/1/2010 to 12/31/2012

Fabrication and Evaluation of Renal Artery Extensions for Fenestrated AAA Endovascular.
Martin W. KING
Office of Undergraduate Student Research, NCSU
$1,575.00
1/1/2012 to 8/1/2012

New Dynamics Controlled Melt Spun/Melt Ordered Process Yielding Ultra-High Tenacity/Modulus Fibers
Richard Kotek
00002
$168,198.00
1/1/2010 to 12/31/2012

Novel Melt Spun/Melt Ordered Process for Producing High Performance Polyester Fibers
Richard Kotek
00002
$147,796.00
7/1/2010 to 8/31/2012

Development of Solvent Systems and Product Screening Samples In Support of High Soy Protein Content Cellulose Fibers
Richard Kotek
00002
$34,054.00
12/1/2010 to 11/30/2011

Novel Filtration Technologies for End-Stage Kidney Disease
Marian G. McCord, Melanie Joy
00006
$50,000.00
8/1/2010 to 7/31/2011

Grand Challenges in Biomanufacturing Fellowship
Marian G. McCord
00006
$40,000.00
8/1/2011 to 5/15/2012

Insecticidal Textiles Research
Hemofiltration Device for Hyperphosphatemia Treatment
Marian G. McCord
00006
$2000.00
4/14/2012 to

Superoleophobic Textiles
Harold S. Freeman, David Hinks, Hoon Joo Lee, Stephen Michielsen
00403
$450,000.00
5/1/2007 to 6/20/2011

Ultra-oleophobic Textile Surfaces for Removal of CB Warfare Agents
Hoon Joo Lee, Stephen Michielsen
00400
$800,000.00
7/15/2008 to 7/14/2011

Durable Antistatic Polyester
Stephen Michielsen
00002
$1,000.00
5/1/2011 to 4/30/2012

Melt-Spun Bi/Tricomponent Fibers Exhibiting Shape Memory: A Mesoscale to Macroscale Experimental and Theoretical Study
Melissa Pasquinelli (Lead PI), Richard Spontak, and Behnam Pourdeyhimi
NCRC
Approximately $75,000
1/1/2011 to 12/31/2013

Nordson Melt adhesive equipment loan
Behnam Pourdeyhimi
00002
$1.00
6/1/2006 to 6/1/2011

Direct Formation of Soy Rich Nonwovens from Solution
Behnam Pourdeyhimi
00002
$170,000.00
7/1/2010 to 6/30/2012

Virtual Fibrous Structure
Benoit Maze, Behnam Pourdeyhimi
00002
$660,577.00
1/1/2011 to 12/31/2013

Facilitating Fiber Degradations
Behnam Pourdeyhimi
00002
$125,160.00
2/1/2011 to 1/31/2012

Evaluation of Micro Denier Nonwovens
Behnam Pourdeyhimi
$24,880.00
7/1/2011 to 8/1/2011

Chancellor's Innovation Fund - Commercial Development of Hollow, Porous, Nonwoven Fibers as Controlled Release Systems for Wound Healing, Tissue Engineering and Regenerative Medicine Applications
Elizabeth G. Loboa, Behnam Pourdeyhimi
$75,000.00
7/1/2011 to 6/30/2012

High Melt Point Soy Stabilization for Fibers
Behnam Pourdeyhimi
$107,400.00
10/1/2011 to 9/30/2012

Meltblowing of Lignin
Behnam Pourdeyhimi
$25,000.00
10/27/2011 to 4/23/2012

Disposable, High-Throughput, High-Capacity Antibody Capture Membranes with an In-Line Sensor
Ruben G. Carbonell, Behnam Pourdeyhimi, Orlando Jose Rojas
$250,000.00
12/1/2011 to 11/30/2013

Development of Acoustic Nonwoven Technology
Behnam Pourdeyhimi
$10,695.00
12/1/2011 to 1/15/2012

Characterization of Polymers with the Kerr-Effect
Alan E. Tonelli
$220,000.00
5/1/2010 to 4/30/2013

Transport of Small Molecules through Fibrous Materials
Julie Crowe Willoughby
$7,500.00
1/1/2011 to 12/31/2011

Intelligent Design of 3D Scaffolds for Tissue Engineering
Julie Crowe Willoughby
$6,000.00
7/1/2011 to 6/30/2012

Biorefinery Lignins As Stabilizers Of Emulsions For Power Generation
Orlando Jose Rojas, Julie Crowe Willoughby
00007
$149,021.00
10/15/2011 to 10/14/2013

Field Deployable Nutrient-Rich Biodegradable Matrix for Crop Protection
Julie Crowe Willoughby, Steve Lommel
Bill and Melinda Gates Foundation
$100,000.00
5/1/2012 to 10/1/2013

Atmospheric Pressure Plasma-Electrospinning Hybrid Nanofiber Mat Production
Xiangwu Zhang (lead PI), Marian G. McCord, Mohamed A. Bourham
00400
$597,048.00
6/2/2008 to 6/1/2011

New High-Energy Nanofiber Anode Materials
Xiangwu Zhang (lead PI), Peter S. Fedkiw, Alex Q. Huang, Saad A. Khan
00001
$1,349,752.00
9/16/2009 to 8/15/2012

Battery Separators Containing Electrospun Nanofibers
Xiangwu Zhang (lead PI), Ewan Gareth David Pritchard
00002
$499,467.00
3/1/2010 to 2/28/2012

Electrospun Nanofibers and Composites for Advanced Lithium Batteries
Xiangwu Zhang (Lead-PI), Peter S. Fedkiw, Saad A. Khan, and Behnam Pourdeyhimi
National Textiles Center
$187,723.00
8/1/2009 to 4/30/2012

Challenges in Advanced Nanofiber Wound Dressings
Marian McCord, Mohamed Bourham, and Xiangwu Zhang (Co-PI)
National Textile Center
$190,867.00
8/1/2009 to 4/30/2012

Development and Integration of Advanced Lithium-Ion Batteries for Small Satellites
Xiangwu Zhang (lead PI) and Subhashish Bhattacharya
University of Florid
$52,000.00
2/9/2009 to 7/31/2012

High-Power and Long-Cycle Life Rechargeable Batteries
Xiangwu Zhang
NCSU Future Renewable Electric Energy Delivery and Management Systems Center (FREEDM)
$203,677.00
9/1/2008 to 8/31/2012

Water-Repellent Nanofibers and Improvement of Their durability by Atmospheric Pressure Plasma Treatment
Xiangwu Zhang (lead PI), Marian G. McCord, and Mohamed A. Bourham
Institute of Textile Technology
$49,076.00
1/1/2010 to 6/30/2011
Internationalization Seed Grant: International Initiative on Energy-Storage Research and Education between NCSU and Zhejiang University
Xiangwu Zhang,
University Standing Committee on International Programs (CIP)
$5,000.00
1/1/2012 to 6/30/2012

Undergraduate Research: Lithium-Ion Battery
Xiangwu Zhang, Stephen Vicchio (student)
NCSU FREEDM Center
$4,000.00
4/15/2012 to 8/3/2012

Undergraduate Research: Lithium-Air Battery
Xiangwu Zhang, Mai-Hsuan Sabrina Huang (student)
NCSU FREEDM Center
$6,000.00
6/15/2012 to 12/15/2012

Fundamental Research on Lithium-Air Batteries
Guanjie Xu, and Xiangwu Zhang (Co-PI)
China Scholarship Council
$48,000.00
8/15/2009 to 8/14/2013