NTC Research Briefs Introduction

The National Textile Center (NTC) is a research consortium of eight universities: Auburn University (Consumer Affairs, Engineering), University of California at Davis, Clemson University, Cornell University, Georgia Institute of Technology, University of Massachusetts at Dartmouth, North Carolina State University and Philadelphia University.

To view the full Research Brief of the work described in the highlight below, click on the project title. For further research details, see the project's website reported in this Research Brief, in the 2009 Annual Report, on the web at http://www.ntcresearch.org/current/FY2009/FY2009_proj.htm or on the latest CD. You can keyword search and view all NTC Reports ever published at http://ntcresearch.org and also view all reports on the CD.

To contact any principal investigator, see their bio following each Research Brief for their email address, phone, website address and NTC project numbers. Bios for all principal investigators who ever participated in an NTC project are continuously updated on the web at http://ntcresearch.org/PDF_BIO_index.htm and/or on the latest CD/ROM.

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NTC Research Briefs by Competency Groups

Materials

Research in the design, development and measurement of natural and synthetic polymeric materials and fibers, including polymer mixtures and additives.

Functional Fibers via Biomimesis

We are developing a fundamental understanding of how liquid wets and flows in nanoporous fibers and nanofibrous substrates. (Hsieh with Clemson, Natick) [M05-CD01]

Hierarchically Designed and Conductive Elastomeric Fibers

By engineering molecular conformations, we are developing elastomeric polymers and fibers with improved mechanical properties and tunable electrical conductivity. (Jacob with UMass Amherst) [M06-GT03]

Improving Textiles with Cyclodextrins

We are exploiting the tendency of cyclodextrins to form inclusion compounds with many small molecule additives and polymers to improve/enhance textile properties. (Tonelli with Georgia Tech) [M06-NS02]

Fiber Based Biohazard Sensor Assemblies

Sensor assemblies are created by including molecular biohazard sensors into fibers and incorporating these fibers into fabrics. (Frey) [M08-CR01]

Flexible Electrodes for Electroluminescent Textiles

We are developing inkjet printing of flexible composite transparent electrodes, based on carbon nanotubes, for electroluminescent displays. (Calvert) [M08-MD07]

Nanoscale Surface Embrittlement of Fibers

We seek to fundamentally understand the mechanism at the molecular level of fiber surface embrittlement due to free radical oxidation at melt extrusion and to find ways to minimize it. (Chalivendra) [M08-MD13]

Electrospun Composite Nanofibers for Lithium-Ion Batteries

We are developing nanofibers and composite nanofibers for lithium and lithium-ion battery applications. (Zhang) [M09-NS01]

Muscle-Like Extruded Actuators

By extruding multi-component fibers from dielectric elastomers, we are fabricating fiber actuators that can change their dimensions and generate forces when activated with electric fields. (Ghosh) [M09-NS02]

Fabrication

Research in the fabrication, processing and manufacture of fibrous structures and fabricated products.

Scent-Infused Textiles to Enhance Consumer Experiences

We are developing polymer fibers that incorporate effective, long-lasting fragrances for innovative and marketable textiles and to measure their psychology of acceptance. (Pierce) [F05-PH03]

Direct Writing Biological Patterns & Constructs onto Fabrics

We are exploring the knowledge of direct writing biological patterns and constructs onto fabrics to create textile-based bio/medical microdevices. (Huang with Rensselaer Polytech) [F06-CL02]

Ultra-fine Filament Yarns Made by Supersonic Jet Splitting

We are developing the fundamental understanding to lead to a new approach towards cost-effective production of ultra-fine continuous filament yarns. (Yao) [F06-GT01]

Piezoelectric Fabrics for Energy Harvesting

Piezoelectric fabrics are ideally suited to power wearable electronics, an application where bulky batteries are very impractical. (Guillot) [F06-GT05]

Transport in 3-D Nanofab Geometries

We are developing experimental and numerical fluid transport models for 3D nanofabricated devices. (Bhowmick) [F06-MD04]

Formation and Performance of Auxetic Textiles

We have combined our knowledge of geometry and fabric structural characteristics to produce auxetic knit structures from non-auxetic yarns. (Ugbolue) [F06-MD09]

Blue-Cured Adhesives for Bonding and 3-D Medical Textiles

We are exploring the use of blue light instead of UV to rapidly cure bonding resins and to build 3-D fabric structures for biomedical uses, such as tissue engineering. (Calvert) [F06-MD14]

Environmental Fabrics and Breathing Wall Systems

We are developing fabric and modular wall assemblies to retrofit existing buildings to combat Sick Building Syndrome and will be developing multiple skins structures. (Messinger) [F06-PH03]

Cellulose/Soy Protein Based "Green" Composites

We are developing “Green” composites with good mechanical properties using sustainable cellulosic fibers and plant-based resins based on modified soy proteins. (Netravali) [F08-CR01]

Polymer Flow Within Elastic Boundaries: Stronger Continuous Nanofibers

We are understanding fundamental flow phenomena in bicomponent extrusion that allows the production of ultra-strong fibers from commodity polymers (Hinestroza) [F08-CR02]

Engineered Reinforced Structures from Short Fibers

We are developing innovative electro-pneumatic devices to form 3-D short fiber pre-forms with controlled fiber orientation distribution (FOD) using electrostatic forces. (Kim) [F08-MD01]

Fiber-Based Bioconversion Media for Bioethanol from Syngas

We are developing highly efficient fiber-based biomedia for converting syngas derived from renewable feed stocks such as agricultural wastes to bioethanol. (Kim) [F08-MD02]

Nanofiber Enhanced Wound Dressings

We are addressing the technical and manufacturing challenges of incorporation of performance-enhancing nanofibers into traditional textile-based wound dressings. (McCord) [F09-NS06]

Chemistry

Research in chemical applications to, and modifications of, fibers and fiber substrates, including dyeing, finishing and waste reduction.

Textiles with Highly Selective Receptors for Specific Molecules

By molecular imprinting polymers on fibers, we are designing novel functionalities with molecular recognition capability for molecular separation, isolation, immobilization and sensing applications. (Luzinov) [C05-CL01]

Antimicrobial Membranes for Protective Clothing

Antimicrobial membranes for protective clothing kill bacteria upon contact.
(Obendorf with UC Davis) [C05-CR01]

Effect of Silicone Finishes on the Burning Behavior of PET

To mitigate adverse silicone interactions, we are developing fundamental understanding of the impact of siloxanes on the burning behavior of polyester fibrous structures. (Drews with U of Georgia) [C06-CL01]

Hydrodynamic Lubrication in Fiber Processing

We are expanding our fundamental understanding of the mechanisms of hydrodynamic fiber lubrication to aid in the development of future generations of fibers and fiber lubricants. (Krause) [C06-NS07]

Blue Light Curable Inkjet Ink System

We are developing an ink chemical system curable using blue light to avoid the drawbacks of using UV radiation or thermal energy in digital pigment printing. (Fan) [C09-MD01]

Systems

Research in the management of product design, sourcing, production, distribution and consumption systems.

Fabric/Skin Interactions: Contact, Friction and Dynamic Motion

We are developing multi-scale models of physical and physiological interactions (e.g.contact/friction between fabric and skin and impact of dynamic motion (e.g. walking). (Pan with UCSF) [S05-CD04]

Research Network on Multifunctional Protective Clothing

We are forming a group of researchers and manufacturers to focus on multifunctional protective clothing and materials for firefighters, paramedics and police officers. (Sun with Auburn, Cornell) [S06-CD01]

Dynamic Textile Process and Quality Control Systems

This Dynamic Quality/Process Control System utilizes all structural equations known to date to design an effective, dynamically responsive system. (Suh) [S06-NS02]

Visual Fit Assessment Tool for Apparel Firms

We are developing a tool for capturing and analyzing fit using 3D body scan technology that can be used by apparel firms both for in-house fit models and target market customers. (Ashdown) [S08-CR03]

Integrated System to Design/Produce Engineered Knit Garments

We are developing a system to create integral and seamless engineered knitted garments considering yarns, knit structure, product requirements and finishing. (Lamar) [S09-NS02]

Logistics of Closed Loop Textile Recycling

We are developing methodologies to use in designing closed loop reverse logistic systems in the textile industry, looking at reverse demand stream estimation, etc. (Joines) [S09-NS04]

Guide to NTC Project Numbers (XNN-YYnns) where …

X = first letter of the competency
NN = last two numbers of the NTC fiscal year (May to April) when the project was first funded
YY = university:
AC = Auburn Consumer Affairs (was A)
AE = Auburn Textile Engineering (was A)
CL = Clemson (was C)
CD = U Cal-Davis (was E)
CR = Cornell (was B)
GT = Georgia Tech (was G)
MD = U Mass Dartmouth (was D)
PH = Philadelphia U. (was P)
NS = North Carolina State (was S)
nn = number assigned by university to project

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NTC Research Briefs by Project Management

University of California at Davis Management

Clemson University Management

Cornell University Management

Georgia Institute of Technology Management

University of Massachusetts at Dartmouth Management

North Carolina State University Management

Philadelphia University Management

Abbreviations

The following abbreviations are not always defined in articles.

Auburn (AE, AC): University of Auburn, Auburn AL 36849 [E=TE;C=Consumer]
Chem Eng: Chemical Engineering
CivE: Civil Engineering
Clemson (CL): Clemson University, Clemson SC 29634
Cornell (CR): Cornell University, Ithica NY 14853
dpf: denier per filament
DSC: differential scanning calorimetry
ESR: electron spin resonance
Fib: Fiber
FTIR: Fourier Transform Infrared
Georgia Tech (GT): Georgia Institute of Technology, Atlanta GA 30332
LSU: Louisiana State University
MAE: Mechanical and Aerospace Engineering
ME: Mechanical Engineering
M.I.T.: Mass. Inst. of Technology
NC State (NS): North Carolina State University, Raleigh NC 27695
NMR: nuclear magnetic resonance
PET: poly(ethylene terephthalate)
PhilaU (PH): Philadelphia University, Philadelphia PA 19144
Poly Sci: Polymer Science
RPI: Renssalaer Polytechnic Institute
SEM: scanning electron microscopy
TAM: Textile and Apparel Management
$[TC]^2$:Textile/Clothing Technology Corp
TE: Textile Engineering
TEM: transmission electron microscopy
Tex: Textile
TexE: Textile Engineering
TFE: Textile and Fiber Engineering
TFPS: Textile, Fiber & Polymer Science
TRI: Textile Research Institute (Princeton NJ 08542)
UAB: Univ. of Alabama-Birmingham
UC-Davis (CD): University of California – Davis, Davis CA 95616-8722
UD: University of Delaware
UG: University of Georgia
UNC-G: University of North Carolina at Greenville
UMassD (D): University of Massachusetts at Dartmouth MA 02747
UNL: University of Nebraska at Lincoln
UNO: University of New Orleans
U of PA: University of Pennsylvania
U of Tenn: University of Tennessee
URI: Univ. of Rhode Island

Discontinued Projects

[ordered by University, then competency, then year]

The following NTC projects were discontinued because they successfully completed their maximum three-year life span (or one-year for seed projects) or because other research was of higher priority. For their last Annual Report, click on the project title below or see the NTC website at **http://www.ntcresearch.org**, or the Table of Contents for the ***June 2008 NTC Research Briefs*** or the ***November 2009 NTC Annual Report***. You may also contact the principal investigators whose phone numbers and E-mail addresses are listed therein. New projects often grew out of completed projects (See the notes following the listings below for any new projects).