

letter from the Editor

Research Briefs and NTC Annual Reports : Now Searchable in Cyberspace

This Research *Briefs* is also available electronically on our World Wide Web site at <http://ntc.tx.ncsu.edu> for you to download or E-mail to someone else. In fact, all NTC Research Briefs and NTC Annual Reports that have issued since December 1993 are on the NTC Web site. Once you get to the site you can find the report you are looking for in two ways. First, they are organized the same way the paper copies are -- click on *Research Briefs*, then on the report you want to read or download. Secondly, you can now search all the reports at once or limit your search to just one report. At the initial NTC home page, click on *Search Engine*. You will be asked to enter a keyword or several keywords connected with "and" or "or" [Yes, you have some Boolean logic capability!]. You can also ask to include synonyms of your keywords and for all words containing your keyword. For example, a search for "apparel and sew" found 18 "apparel" articles where 16 contained the words "sew", "sewn" or "sewing" and one each with "sewage" and "elsewhere". So give it a try!

"Talk" to Us:

As you read this issue of *Research Briefs* you might have a question or simply want to find out more about an NTC project. As well as checking out the longer, more detailed annual report on the Web, we encourage you to telephone the NTC primary investigators directly or to write them on E-mail. See the inside back cover for telephone numbers and E-mail addresses.

New NTC Wilmington address

Remember: NTC has new address: 2207 Concord Pike, Wilmington DE 19803-2908. [The phone numbers remain the same. See the inside front cover for more details.]

Tom Doherty
(302)-478-4758
FAX = (302)-479-9595
[phone first]
tdoherty@magpage.com



Table of Contents

Material Science *Research in the design, development, manufacture and measurement of natural and synthetic polymers and fibers, including polymer mixtures and additives.*

| | |
|--|---|
| Designing Molecules Using Molecular Orbital Theory | 1 |
| We are designing textile fibers, dye molecules and chemical auxiliaries by computer. [S95-22] | |
| Molecular Structure of High Tech Fibers | 2 |
| We are developing a fundamental molecular understanding of property development in electrically conductive fibers. [C95-6] | |
| Maximizing Fiber Conductivity | 3 |
| We are developing a fundamental understanding of how polymer processing conditions affect development of molecular structure in conductive and optical fibers. [C95-4] | |

| | |
|---|---|
| Low Cost, Tough Industrial Fiber | 4 |
| We are seeking synthetic fibers with the toughness of spider silk drag filaments. [G95-8] | |
| Fiber Microstructure and Fatigue | 5 |
| We are assessing fatigue damage accumulation on fiber microstructure. [S94-2] | |
| Torsional Properties and Fiber Microstructure | 6 |
| If we can thoroughly understand fiber microstructure of highly anisotropic fibers, we think we can significantly improve their compressive strengths. [C94-4] | |

Fabrication

Research in the design, development, manufacture and measurement of fibrous structures, including yarns, textiles, garments, nonwovens, carpets, coated fabrics, papers, preforms, etc.

| | |
|--|----|
| Nonlinear Phenomena in High-Speed Yarn Transport | 7 |
| We seek to understand nonlinear yarn tensions and balloon shape fluctuations during the high speed translational and rotational movement of yarns. [S94-9] | |
| Integration of Independent Textile Processes | 7 |
| We are integrating interdependent textile manufacturing processes in a hierarchial and interactive way. [C95-13] | |
| Shuttle Plate Braider | 8 |
| We are expanding the flexibility of the shuttle plate braider to permit the weaving of more moving yarn ends. [C95-9] | |
| Textile Structures for Composites | 9 |
| We are constructing a mechanical model to predict non-linear behavior of textile composites. [A95-24] | |
| Fatigue Failure in Load Bearing Applications | 9 |
| We are studying the fatigue failure modes of elastomers used in load bearing applications, such as total hip joint prosthesis. [C94-2] | |
| Comfortable Barrier Textile Systems | 11 |
| We are developing fabrics and garment systems which protect the wearer against chemical and biological hazards, yet are comfortable and cost effective. [S95-24] | |
| Computer Aided Apparel Equipment Design | 12 |
| We are applying computer-aided-engineering techniques to develop precise fabric handling capabilities for apparel assembly processes. [S95-20] | |
| Geotextiles | 13 |
| We are investigating the structure-performance relationship of geotextiles. [A94-8] | |

Chemical Modification

Research in dyeing, finishing and waste reduction in textile processes.

| | |
|--|----|
| Real-Time Control of Batch Dyeing | 15 |
| Our neural network color matching technique is twice as accurate as current methods. [S95-4] | |

| | |
|--|-----------|
| Dye Diffusion in Polyamide and Polyester Fibers | 16 |
| We are developing an understanding of dye diffusion in polyamide fibers to eliminate dye streaks by chemical means. [S95-7] | |
| Moisture in Fibrous Structures | 17 |
| We are investigating moisture distribution and transport in engineered fibrous structures. [G95-2] | |
| Supercritical Fluid | 18 |
| We are investigating the properties of supercritical fluids for analytical, process and environmental applications in polymers, fibers and textiles. [C95-3] | |
| Formaldehyde-Free Crosslinking of Cellulose | 18 |
| We are developing an epoxy-quaternary ammonium cellulosic crosslinking system that does not need alkali or salt. [A95-8] | |
| Plasma Treatments | 19 |
| Using our new atmospheric plasma system, we can significantly alter the bulk physical properties of fibers. [S94-13] | |
| Ultrasonics to Dye and Dry | 20 |
| We are developing a fundamental understanding of the mechanisms of ultrasonic-assisted textile wet processing. [G95-13] | |
| Quick Response Printing | 21 |
| We are developing electrophotographic and inkjet printing processes for quickly applying complex patterns to textile substrates without effluent. [G95-1] | |
| Source Reduction of Pollutants | 22 |
| We have demonstrated in plant tests the controlled recycling of bleaching rinse water and decolorizing of dyeing wastewater. [G95-14] | |

Intelligent Systems
Research in systems to enable rapid response, including computer modeling, sensor technology, expert systems, customer interactive design, market research and demand-activated, closed-loop production systems.

| | |
|---|-----------|
| Artificial Life Simulation of Textile/Apparel Marketplace | 23 |
| We are developing artificial life simulations to detect emerging behaviors in the textile/apparel marketplace. [A95-20] | |
| Intelligent Systems for U.S. Softgoods Complex | 24 |
| We are developing flexible software tools and analysis techniques to support strategic planning and decision making in the U. S. softgoods complex. [S95-2] | |
| Demand Activated Manufacturing | 25 |
| We are developing a hierarchical control system which integrates data from previous and subsequent processes to optimize production of short runs. [G95-7] | |
| Mass Customization | 26 |
| We are designing strategies to move the integrated textile complex towards mass customization. [A95-19] | |
| Fingerprinting Textile Properties Back to Processing | 27 |
| We are developing ways to track quality features backward through textile production. [A95-11] | |

| | |
|---|-----------|
| NAFTA Implications | 28 |
| We modified our econometric model of the global textile industry to improve its practical applicability and to better address industry needs. [A93-4] | |
| Part Layout in Apparel | 30 |
| We wish to optimize garment part layout using computer algorithms. [A94-13] | |
| On-Line Inspection of Sewn Seams | 30 |
| We are developing techniques to monitor and automatically control on-line the construction and quality of sewn seams. [S94-4] | |
| Fabric Defect Control | 31 |
| We are developing a fabric defect detection system which is capable of monitoring and controlling quality on-line. [G94-2] | |
| Demand Responsive Marketing | 32 |
| Global consumer studies show potential new export opportunities for U.S. apparel. [A95-23] | |
| <i>For Further Information (References)</i> | 34 |
| <i>Index By Project Management</i> | 38 |
| <i>Index By Principal Contributors</i> | 40 |
| <i>Discontinued Projects</i> | 41 |
| <i>Abbreviations</i> | 41 |
| <i>NTC Directory: Principal Investigators and Staff</i> | 42 |