

Fiber & Biopolymer Research Institute

Newsletter September 2020-August 2021

40th Session of the Texas International Cotton School

The 40th session of the Texas International Cotton School was held August 2nd-12th, 2021. The Lubbock Cotton Exchange in coordination with the Fiber & Biopolymer Research Institute hosted 8 professionals from across different areas of the cotton industry and 3 Texas Tech University Graduate Students. These students were immersed into the many aspects of cotton from the farm to the textile mill and everything in between. This was an intensive two-week educational course on cotton and textiles that provided experience, knowledge, and insight into future developments affecting global markets.

Speakers from the different segments of the cotton industries volunteered their time to bring their knowledge to this class. Some of the classes that were taught were: History of the Cotton Industry & Systems, Conversion of Yarn to Fabric, Cotton Sustainability, Cotton Insurance, Trade Finance and so many more. The students also went on tours at: The Heinrich Brothers Farm, the FBRI, BASF, Lubbock Cotton Growers Gin & Farmers Coop Compress to name a few. During these two-weeks, the students were given many opportunities to network and connect with professionals from across the industry.



40th Texas International Cotton School Students: Front Row: Vy-Linh Nguyen, Jingbo Moore, Segayle Foster, Shannia Bustos, Yu Shi Chen, Maliha Marzana Back Row: Xing Ying Chen, Md Rashedul Hasan, Christopher Turner, Ejajul Hogue, Dolle Barker

Invention disclosures in 2021

- 1. J. Shamshina, N. Abidi. Preparation of chitin nanocrystals from crustacean biomass using ionic liquid 1-ethyl-3methylimidazolium hydrogen sulfate. Provisional Patent, TECH 1238.
- 2. T. Reid, N. Abidi, N. Bergfeld, P. Tran. Selenium containing antimicrobial compound as a reactive dye and crosslinking treatment for textile applications. Provisional Patent, TECH 1239.

Grants in 2021

- Hequet: Enhancing the marketability of U.S. cotton through length uniformity improvement. Cotton Inc. \$150,000.
- Hequet: Maturity and standard fineness: determination, calibration, and use. Cotton Inc. \$154,510.
- Hequet: Establish the suitability of US cotton for Vortex spinning. Cotton Inc. \$110,029.
- Hequet, Abidi: Exploring alternatives to the current HVI classification system. USDA AMS. \$924,320.
- ♦ Abidi: Chemical and Structural properties of cotton fiber base and associate seed and their impact. CI. \$22,500
- Abidi: NSF-CellMat—High performance sustainable solution to plastic-based materials. National Science Foundation.
 \$50,000.
- ◆ Abidi: Developing bioproducts from low maturity cotton and cotton wastes. Cotton Inc. \$50,000
- Abidi: Exploring the application of Selenium-based compounds on cotton yarns and fabrics. TTUHSC/CH Foundation \$30,000.

Special points of interest:

- 40th Annual Texas International Cotton School.
- New Research Faculty
- New postdoc scientists
- New FBRI Technicians

FBRI Newsletter

FBRI Team Expands



Julia L. Shamshina Ph.D



Christopher Turner Ph.D



Md Abu Sayeed Ph.D New Graduate Students



R. Hasan, M.S. (Advisor: Hequet)



N. Uddin, MS. (Advisor: Abidi, Shamshina)

Other Staff News

- Mario Pedroza, Dolores Lopes, Raquel Ruiz, and Brenda Young were promoted to Senior Technicians.
- Tytayonna Outland was promoted to Tech. III.
- Connie Herrera (Senior Technician) passed away in September. Our thoughts and prayers are with her family. Connie was one of our best employees. She joined FBRI October 1, 2001.

Students Graduation in Spring and Summer

- Prakash Parajuli, PhD. Major: Plant & Soil Science. (Chair: Dr. Abidi)
- Harsh Chaudhari, Masters. Major: Plant & Soil Science. (Chair: Dr. Abidi)

New Staff members

The FBRI was pleased to welcome also two new technicians this Fall. Maria Sosa and Dominga Anaya will be working as technicians in our Cotton Phenomics Lab. Maria comes with 30 years experience working at the USDA classing office seasonally.



Maria Soza, Tech. III



P. Parajuli. PhD.



Dominga <mark>Anay</mark>a , Tech. I



H. Chaudhari, MSc.

In January of 2021, Dr. Shamshina joined Fiber and Biopolymer Research Institute (FBRI) at Texas Tech University as a Research Assistant Professor. Her current research interests focus on all aspects of biopolymer processing, from fundamental properties to overall material preparation to industrial applications. She is particularly interested in development of high-value biopolymeric products with a control of shapes, sizes and porosities, with an ultimate goal of elimination of synthetic plastics. She is a recipient of the American Chemical Society Green Chemistry Challenge Award Focus Area 2, Greener Reaction Conditions for "A Practical Way to Mass Production of Chitin: The Only Facility in the U. S. to Use Ionic Liquid-Based Isolation Process", has authored 73 peer-reviewed publications, 11 book chapters, and is inventor on 19 patents/ patent applications.

Chris Turner is a Post-Doctoral Research Associate with the Fiber and Biopolymer Research Institute. He obtained a Ph.D. from the TTU Department of Electrical and Computer Engineering in 2016 with a research focus on computer vision and machine learning. From 2016 until 2020, he worked as a Research Associate with the TTU High Performance Computer Center. There he provided advanced consultation for faculty and students in the use of the academic computing clusters as well as helping plan and implement cluster upgrades. In 2020, he began his current position with the FBRI where he uses his technical expertise to improve cotton fiber quality measurements.

Dr. Sayeed joined FBRI as a Post-Doctoral Research Associate. He obtained a B.S degree and M.S. degree from the University of Dhaka, Bangladesh. He graduated in the spring 2020 with a Ph.D. in Plant and Soil Science (Major Fibers and Biopolymers) from the Department of Plant and Soil Science at Texas Tech University. During his doctoral research, Sayeed developed new technologies to improve cotton fiber quality measurements. In his current position, his focus is to continue develop-

ing and implementing new fiber quality measurements to be used by the cotton industry.

Brooke Shumate, Ph.D.

Reagan Heinrich, MSc. (Advisor: Kelly)

(Advisor: Kelly)

FBRI peer-reviewed publications

Peer Review Publications:

- 1. S. Acharya[¥], Y. Hu, N. Abidi, Cellulose dissolution in ionic liquid under mild conditions: Effect of hydrolysis and temperature. *Fibers*. 2021, 9,5. *https://doi.org/10.3390/fib9010005*.
- 2. A. Errich, K. Azzaoui, E. Mejdoubi, B. Hammouti, N. Abidi, N. Akartasse, L. Benidire, S.EL. Hajjaji, R. Sabbahi, A. Lamhamdi. Toxic heavy metals removal using a hydroxyapatite and hydroxyethyl cellulose modified with a new Gum Arabic. *Indonesian J. Science and Technology*, 6(1) (2021) 41-64.
- 3. S. Acharya^{*}, S.S. Rumi^{*}, N. Abidi. Microfibers from synthetic textiles as a major source of microplastics in the environment-A review. *Textile Research Journal*. 91(17-18) (2021) 2136-2156 (IF: 1.926)
- **4.** S.S. Rumi*, S. Liyanage[¥], N. Abidi. Conversation of low-quality cotton to bioplastics. *Cellulose*. 28(2021)2021-2038. (*IF*: 4.21)
- 5. A.F. Harris, J. Lacombe, S. Liyanage[¥], M. Han, E. Wallace, S. Karsunky, N. Abidi, F. Zenhausern. Supercritical carbon dioxide decellularization of plant leaves to engineer three-dimensional tissue scaffolds. *Scientific Reports*, 11:3643 (2021). (*IF*: 3.998)
- 6. N. Abidi. Cellulose macromolecule as a source for advanced materials preparation. *Materials Today: Proceedings*. 45 (2021) 7473-7476.
- 7. P. Parajuli*, S. Acharya^{*}, J.L. Shamshina, N. Abidi. Tuning the Morphological Properties of Cellulose Aerogels: An Investigation of Salt-Mediated Preparation. *Cellulose*, 28(2021)7559-7577.
- R.S. Dassanayake, N. Dissanayake, J.S. Fierro, N. Abidi, E.L. Quitevis, K. Boggavarappu, V.D. Thalangamaarachchige. Characterization of Cellulose Nanocrystals (CNCs) by Current Spectroscopic Techniques. *Applied Spectroscopy Reviews*. (2021). https://doi.org/10.1080/05704928.2021.1951283
- **9.** R.S. Dassanayake, S. Acharya[‡], N. Abidi. Recent Advances in Biopolymer-based Dye Removal Technologies. *Molecules*, 26(2021)4697. <u>https://doi.org/10.3390/molecules26154697</u>.
- 10. J.L. Shamshina, N. Abidi. Cellulose Nanocrystals from Ionic Liquids: A Critical Review. *Green Chemistry*. *Green Chemistry* 23(2021) 6205-6222. DOI: 10.1039/d1gc02507d.
- 11. S. Liyanage[‡], S. Ácharya[‡], P. Parajuli^{*}, J.L. Shamshina, N. Abidi. Production and surface modification of cellulose bioproducts. *Polymers*, in press.
- Shamshina, J.L.; Qin, Y.; Belmore, K.; Daly, D. T.; Rogers, R. D. "Switchable Carbamate Coagulants to Improve Recycling Ionic Liquid from Biomass Solutions," *GreenChE* 2021, DOI: 10.1016/j.gce.2021.07.001 (Invited for a Special Issue "Frontiers of Ionic Liquids", Corresponding Authorship, TTU)
- **13. J. Shamshina**, R. Stein, N. Abidi. Choosing the right strategy: Cryogrinding vs ball milling Comparing apples to apples. *Green Chemistry*, revision submitted.
- 14. Achinivu, A. C.; Shamshina, J.L.; Rogers, R. D. Chitin Extracted from Various Biomass Sources: It's Not the Same, *Fluid Phase Equilibria*, 2021. (Invited for a Special Issue on bio-product extraction, Corresponding Authorship, TTU).
- **15.** C.W Smith, K Joy, S Hague, E. Hequet, B Kelly, D Jones. **2021**. TAM KJ-Q14 ESU and TAM 12J-39 ESU upland cotton germplasm with improved fiber bundle strength. Journal of Plant Registrations 15 (2), 351-358
- 16. N. Esmaeili, Y. Cai, F. Tang, X. Zhu, J. Smith, N. Mishra, E. Hequet, G. Ritchie, D. Jones, G. Shen, P. Payton, H. Zhang. 2021. Towards doubling fibre yield for cotton in the semiarid agricultural area by increasing tolerance to drought, heat and salinity simultaneously. Plant biotechnology journal 19(3), 462
- 17. C.W. Smith, S. Hague, E. Hequet, B. Kelly. 2021. Plant breeding and genetics: Yarn performance of Texas quality upland cotton germplasm. Journal of Cotton Science 25(1), 21-30
- 18. M.A. Sayeed[₹], M. Schumann, J. Wanjura, B.R. Kelly, W. Smith, E.F. Hequet. 2021. Characterizing the total withinsample variation in cotton fiber length using the High-Volume Instrument fibrogram. Textile Res. J. 91 (1-2), 175-187

Book chapters:

- 1. S. Liyanage[₹], P. Parajuli^{*}, Md.T. Hossain^{*}, H. Chaudhari^{*}, N. Abidi. 2021. Chapter 11: Antimicrobials for protective clothing. *In:* Antimicrobial Textiles from Natural Resources. Md. Ibrahim H. Mondal (Ed.) Elsevier. ISBN: 978-0-12-821485-5 (print), ISBN: 978-0-12-821486-2 (online). pp. 349-376.
- 2. P. Parajuli^{*}, S. Acharya^{*}, S.R. Sultana^{*}, Md.T. Hossain^{*}, N. Abidi. 2021. Chapter 4: Regenerated cellulose in textiles: rayon, lyocell, modal, and other fibers. *In:* Fundamentals of Natural Fibers and Textiles. Md. Ibrahim H. Mondal (Ed.) Elsevier. ISBN: 978-0-12-821483-1 (print), ISBN: 978-0-12-821484-4 (online). pp 87-110.
- **3.** Berton, P.; **Shamshina, J.** L. "Chapter 3: Ionic Liquids for Topical and Transdermal Drug Delivery," *In*: Application of Ionic Liquids in Drug Delivery. Goto, M.; Moniruzzaman, M. (Eds.); Springer Nature Singapore Pte Ltd, **2021**, 35-50.
- 4. Shamshina, J. L.; Rogers, R. D. "Chapter 5: 3D printing of Cellulose and Chitin from Ionic Liquids for Drug Delivery: a Mini-Review," *In*: Application of Ionic Liquids in Drug Delivery. Goto, M.; Moniruzzaman, M. (Eds.); Springer Nature Singapore Pte Ltd, 2021, 71-90.

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*: Graduate student, ¥: Postdoc, Ψ: Previous student

Presentations

1. H.B. Wineinger, R.D. Rogers, **J.L. Shamshina**, "Biopolymers as Plastic Alternatives: New Method for the Determination of Molecular Weight," Presented by J. L. Shamshina before the 261st ACS National Meeting (April 5 - 30, 2021), Virtual, Abstract number 3557316.

2. H.B. Wineinger, R.D. Rogers, **J.L. Shamshina**, "Biopolymers as Plastic Alternatives: An Ionic Liquid Strategy to Increase Chitin Yield per Animal while Controlling Molecular Weight," Presented by J. L. Shamshina before the 25th Annual Green Chemistry & Engineering Conference (June 14 - 18, 2021), Virtual, Abstract number 3565944.

3. N. Abidi. From cellulose to bioplastics. International Cotton Conference Bremen – 2021 Hybrid Edition, March 17-18, 2021.

4. N. Abidi. Preparation and functionalization of cellulose films from cotton fibers. TAPPI (Technical Association of the Pulp and Paper Industry) Virtual Conference. May 4-5, 2021 (invited).

5. S. Rumi*, S. Liyanage^{*}, N. Abidi. Preparation and characterization of transparent and flexible cellulose film produced from low-quality cotton fibers. Virtual American Chemical Society National Meeting and Exposition, April 5 – May 1, 2021.

6. P. Parajuli, S. Acharya[¥], **N. Abidi**. Inorganic salts mediated manipulation of physicochemical properties of cellulose aerogels. Virtual American Chemical Society National Meeting and Exposition, April 5 – May 1, 2021

7. S. Acharya^{*}, Y. Hu, N. Abidi. Dissolution of cotton fibers in ionic liquid based solvent system: Effects of hydrolysis, cryogenic grinding and temperature. Virtual American Chemical Society National Meeting and Exposition, April 5 – May 1, 2021.

8. C.W. Smith, S. Hague, A. Ulrich, J. Gendron, **E.F. Hequet**, B. Kelly. 2021. Progress Developing Improved Texas Upland Cotton Germplasm for Improved Yarn Quality. Beltwide Cotton Conference, January 5-7, 94

9. A.F. Tesema*, **E.F. Hequet**, B. Kelly. 2021. Repeatability of HVI Fibrograms across Multiple Instruments. Beltwide Cotton Conference, January 5-7, 131

10. E.F. Hequet. 2021. Suitability of US Cotton for Vortex Spinning. Beltwide Cotton Conference, January 5-7, 207

11. A. Sayeed[¥], E.F. Hequet. 2021. Estimation of AFIS Short Fiber Content Using the HVI Fibrogram. Beltwide Cotton Conference, January 5-7, 223

11. C.D. Delhom, H.A. King, C.B. Armijo, M. Ulloa, J.R. Mahan, P. Payton, T.G. Teague, **E.F. Hequet**, E.M. Barnes, N. Kothari, R.W. Kurtz, G. Morgan, B. Vandenberg, L. Messinger, G. Zoch, M.D. Buser. 2021. Partnerships for Data Innovation (PDI) Cotton - Tools and Dashboards. Beltwide Cotton Conference, January 5-7, 384

12. E.F. Hequet, **A. Sayeed[¥]**, **C. Turner[¥]**. 2021. Importance of non-HVI (High Volume Instrument) Cotton Fiber properties (invited). ICAC – WCRC webinar.

FBRI Laboratories:

Provide valuable research and evaluation services to cotton breeders, researchers, producers, and seed companies. They also provide excellent opportunities for undergraduate and graduate students to perform their research projects on cotton. In addition to various research projects, our support to the cotton industry include ginning, fiber testing/evaluation, fiber processing, yarning spinning. Questions about testing or research? Please feel free to reach out to us at <u>fbri@ttu.edu</u>

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