

MD TAIBUR RAHMAN

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SUMMARY:

- Expertise in advanced manufacturing, materials, and mechanics with specialization in additive manufacturing (3-D printing), sensors, and high performance ceramics
- Skills in various nanoscale materials characterization techniques such as TEM, electron and X-ray diffraction, TGA, high temperature impedance spectroscopy etc.
- Exposure to several interdisciplinary areas throughout the career including printed electronics, sensors, high performance ceramics, and thin films

EDUCATION:

- PhD Candidate, Mechanical Engineering, CGPA: 3.68 Aug. 14 - Present
Washington State University
Thesis: Sensor Fabrication Using Microscale Additive Printing
- M.S., Mechanical Engineering, CGPA: 4.00 July 2014
University of Texas at El Paso
Thesis: Synthesis, Microstructure and Performance Evaluation of Gadolinium Incorporated Cobalt Ferrite Ceramics
- B.S., Mechanical Engineering, CGPA: 3.71 June 2010
Chittagong University of Engineering and Technology, Bangladesh

PROFESSIONAL EXPERIENCE:

A. Research Experience

1. Research Assistant, WSU

Physical and Biochemical Wireless Sensors by Direct Write Additive Manufacturing Jan.16-Present
The purpose of this project is to explore an environmentally friendly scalable additive manufacturing method to overcome the materials, manufacturing, and design challenges for high temperature operation of the sensors and demonstrate a wireless sensor module. The task of the project is described below:

- Evaluation of the oxidation behavior of metal nanoparticles (NPs) for sensor applications
- Evaluation of electrical properties of NP film at high temperature
- Nano-indentation analysis to understand mechanical property degradation of the materials at high temperature
- Printing of NPs on complex arbitrary shapes using Aerosol Jet technology
- Design and fabrication of high temperature sensor testing setup
- Design, fabrication and evaluation of high temperature sensors
- Interfacial reliability investigation of the sensors by TEM observations

Microscale Additive Manufacturing of Capacitive Touch Sensors May 15-May 16

- Performed design and fabrication of interdigitated capacitive touch sensor using aerosol jet technology
- Demonstrated miniaturized capacitive touch sensors feature sizes down to 45 μm
- Characterized manufacturing variability and its effect on sensor capacitance

3-D Printed Microelectrode Arrays for Bio-sensing Applications Jul. 15-Dec. 15

- Performed design and fabrication of Ag based microelectrode array for bio-sensing applications using aerosol jet technology

- Performed electrochemical analysis to detect H₂O₂ and Glucose

2. Research Assistant, UTEP

Synthesis, Microstructure and Performance Evaluation of Gd Substituted Cobalt Ferrite Aug. 13-Jul. 14

- Performed synthesis of Gd substituted CoFe₂O₄ micro particles
- Performed structural characterization of Gd substituted CoFe₂O₄ ceramics
- Evaluated dielectric properties and performed electrical impedance spectroscopy of Gd substituted CoFe₂O₄ ceramics at high temperature

B. Teaching Experience

1. Teaching Assistant, WSU

Spring 2015

Assisted in grading and teaching as needed for:

- Manufacturing Processes

2. Teaching Assistant, UTEP

Fall 2013-Spring 2014

Assisted in course material preparation, grading and teaching as needed for:

- Mechanics I- Statics
- Material Science and Manufacturing Processes

3. Lecturer, Ahsanullah University of Science and Technology, Bangladesh

Taught following courses:

1. Mechanical Engineering Drawing
2. Introduction to Mechanical Engineering
3. Numerical Analysis
4. Control Engineering
5. Fluid Dynamics Lab
6. Mechanics of Solids Lab

4. Industrial Trainings

Bangladesh Industrial Technical Assistance Center (BITAC), Bangladesh

Sept. 09

- **Specialization:** Manufacturing Process

Training Institute for Chemical Industries (TICI), Bangladesh

Jul. 09

- **Specialization:** Non-Destructive Testing, Vibration Analysis Technique

PUBLICATIONS (JOURNAL):

(To date total citations: 67, h-index: 4, i10-index: 2, Source: Google Scholar)

1. **Md. T. Rahman**, Kathryn Mireles, J. Gomez, Jose Marcial, M. R. Kessler, John McCloy, C.V. Ramana, and R. Panat, "High Temperature Physical and Chemical Stability and Oxidation Reaction Kinetics of Ni-Cr Nanoparticles". (Submitted)
2. J. Geng, **Md. T. Rahman**, R. Panat, and L. Li "Self-assembled axisymmetric microscale periodic wrinkles on elastomer fibers", accepted pending revision, *ASME Journal of Nano and Micro-Manufacturing* (Nov. 2016)
3. **Md. T. Rahman**, J. McCloy, C.V. Ramana, and R. Panat, "Structure, Electrical Characteristics and High-Temperature Stability of Aerosol Jet Printed Silver Nanoparticle Films", *Journal of Applied Physics*, 120, 7, 2016.
4. **Md. T. Rahman**, A. Rahimi, S. Gupta, and R. Panat, "Microscale Additive Manufacturing and Modeling of Interdigitated Capacitive Touch Sensors", *Sensors and Actuators A: Physical*, 248, 94-103, 2016.
5. H. Yang*, **Md. T. Rahman***, D. Du, R. Panat, and Y. Lin, "3-D Printed Adjustable Microelectrode Arrays for Electrochemical Sensing and Biosensing", *Sensors and Actuators B: Chemical*, 230, 600-606, 2016. (*Equal contribution)

6. **Md. T. Rahman**, Luke Renaud, D. Heo, Michael Renn, and R. Panat, "Aerosol Based Direct-Write Micro-Additive Fabrication Method for 3-D Sub-mm Metal-Dielectric Structures." *Journal of Micromechanics and Micro Engineering*, 25 (10), 107002, 2015.
7. **Md. T. Rahman**, C.V. Ramana, "Impedance Spectroscopic Characterization of Gadolinium Substituted Cobalt Ferrite Ceramics." *Journal of Applied Physics*, 116, 164108, 2014.
8. **Md. T. Rahman**, M. Vargas and C.V. Ramana, "Structural Characteristics, Electrical Conduction and Dielectric Properties of Gadolinium Substituted Cobalt Ferrite." *Journal of Alloys and Compounds*, 17, 547-562, 2014.
9. **Md. T. Rahman** and C.V. Ramana, "Gadolinium Substitution Induced Effects on Structure and AC Electrical Properties of Cobalt Ferrite" *Ceramic Internationals*, 40, 9, 14533-14536, 2014.

CONFERENCE PRESENTATIONS (PRESENTERS UNDERLINED):

1. **Md. T. Rahman** and Rahul Panat, "Mechanical and Electrical Properties of Additively Manufactured Metal Nanoparticle Films for Sensor Applications at High Temperature", *TMS*, Nashville, TN (2016).
2. **Md. T. Rahman** and Rahul Panat, "3-D Antenna Structures Using Novel Direct-Write Additive Manufacturing Method" *ASME Interpack/ICNMM*, San Francisco, CA (2015).
3. **M. A. Hossain**, **Md. T. Rahman**, M. I. H. Soiket and S. Hossain, "Investigation and Improvement of Thermal Efficiency of Hypersonic Scramjet" *ASME, IMECE*, Canada (2014).

POSTER PRESENTATIONS (PRESENTERS UNDERLINED):

1. **Md. T. Rahman**, C.V. Ramana and **R. Panat**, "Structure, Electrical Characteristics and High-Temperature Stability of Aerosol Jet Printed Silver Nanoparticle Films", *DOE Annual Meeting*, Washington DC, (2016).
2. **Md. T. Rahman**, D. Heo and R. Panat, "3-D Antenna Structures Using Novel Direct-Write Additive Manufacturing Method, *ASME Interpack/ICNMM*, San Francisco, CA (2015).

TECHNICAL SKILLS:

- **Manufacturing Techniques:** Extensive knowledge on 3-D Aerosol Jet Printing, Photolithography
- **Material Synthesis and Characterization Techniques:**
 - **Synthesis:** Solid State Reaction Method to Grow Ceramic Micro-particles
 - **Electrical Characterization:** High Temperature Impedance and Dielectric Property Analysis of Ceramics and Metals
 - **Gravimetric Techniques:** Thermogravimetric Analysis
 - **Spectrometry:** X-ray Diffraction, X-ray Photoelectron Spectroscopy
 - **Microscopy:** Scanning Electron Microscopy, EDS with Elemental Mapping, Optical Microscopy, Transmission Electron Microscopy
 - **Mechanical Property Characterization:** Film Metallography, Nano-indentation
 - **Sintering Methods:** Flash/Photonic, Laser and Thermal Sintering of Metal Nanoparticles
- **Engineering Design and Analysis Software:** ANSYS Fluent, Comsol, AutoCAD, SOLIDWORKS
- **Programming Languages:** MATLAB, C, Fortran

AWARDS AND HONORS:

- Travel Grant from NSF to Attend ASME InterPACK/ICNMM Conference 2015
- Graduate School Summer Research Scholarship at UTEP May 14 – Jul. 14
- Bangladesh Government Technical Scholarship, CUET 2006 – 2010
- Runner up Intra Hall Badminton Championship 2007

AFFILIATIONS:

- Member, WSU Cricket Club, Right Arm Medium Fast Bowler Jan. 15 – Present
- Treasurer, Association for Bangladeshi Students and Scholars (ABSS) May. 16 – Present
- Senator, GPSA, WSU Jan. 15 – May 16
- Secretary of Advertisement, CUET Debating Society Jul. 09 – May 10

MENTORING ACTIVITIES:

1. Undergraduate student at WSU, as a part of the research project on “**Structure, Electrical Characteristics and Oxidation Behavior of Aerosol Jet Printed Nickel Nanoparticle Films for Sensor Applications**” from March 2016-Present.
2. Undergraduate student at WSU to build “**High Temperature Stain Sensor Test Setup and Installation of Commercial Strain Gauge**” from February 2016- May 2016.
3. Undergraduate student participating in the Research Experience for **NSF Undergraduates LSAMP programs** at Mechanical Engineering Department, WSU, Summer 2016.
4. Undergraduate student participating in the Research Experience for **NSF Partnership for Research and Education in Materials (PREM) program** between UTEP and UCSB, UTEP, Summer 2014

REFEREES:

Dr. Rahul Panat
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Dr. John McCloy
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