

Yeasir Arafat

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Education

Doctor of Philosophy in Mechanical Engineering, CGPA 3.73/4.0 **Expected May 2018**

Washington State University, Pullman, WA

Dissertation Title: "Highly Stretchable Metallic Interconnects for Flexible Electronic Devices", Advisor: Prof. Rahul Panat, Co-advisor: Prof. Indranath Dutta

Bachelor of Science in Mechanical Engineering, CGPA 3.83/4.0 **2009-2012**

Islamic University of Technology (IUT), Gazipur, Bangladesh

Research Interests

Advanced MEMS Fabrication Techniques, thin film development, wearable Flexible Electronics, Bio-monitoring Devices, Metal-Polymer Composites and Interfaces

Research Experience

Doctoral Researcher **August 2014-Present**

School of Mechanical & Materials Engineering, Washington State University

"Super-Stretchable Metallic Interconnects for Flexible Electronics"

- Developed a unique metal-polymer interface architecture that allows metal films to be stretched up to 100% linear strain without failure (i.e. metal stretched to double its original length without failure). This is the highest metal film stretchability achieved in academia and industry, and represents a major advance in enabling wearable devices in areas such as bio-monitoring to stretch, twist, and bend.
- Researched materials such as Indium and Tin for stretchable interconnects, offering an alternative to gold for the first time while increasing stretchability. *This work reduces the cost of wearable devices significantly, and will make them accessible to populations that have been historically underserved.*
- Developed a mechanistic understanding of the deformation of the stretchable metal films on plastic substrates through strain mapping using Digital Image Correlation technique. Currently developing models to understand the load-transfer behavior in such systems
- Identified and demonstrated a technique that prevents a rise in interconnect electrical resistivity under high deformation/stretching. This discovery provides a critical solution for wearable devices where battery life is the primary limiting factor. *Examples include devices used to address disabilities such as low-cost bio-arms, robotic legs, eyesight assistants etc.*
- This work is expected to significantly alter the wearable device industry and the associated IoT segment by introducing a novel methods and materials for low cost wearable bio-devices and IoT devices for mass market

"Electroplating Studies of Soft Metals"

- Investigated the effect of Tin microstructure made under different electroplating conditions on the mechanical and electrical properties.
- Developed acidic solution (SnSO_4 salts in Methanesulfonic Acid) for electroplating of Sn along with Hydroquinone and Gelatin as additives. Used linear sweep voltammetry to obtain optimum plating conditions and vary the microstructures with a wide range of aspect ratios, grain sizes and textures

Publications and Presentations

- **Y. Arafat**, I. Dutta, R. Panat, “Super-stretchable Metallic Interconnects on Polymer with a Linear Strain of up to 100%”, *Applied Physics Letters*, 107, 081906, 2015.
- **Y. Arafat**, I. Dutta, R. Panat, “On the Deformation Mechanisms and Electrical Behavior of Highly Stretchable Metallic Interconnects on Elastomer Substrates”, *Journal of Applied Physics*, Vol. 120, Issue 11, pp. 115103-1 to 11, 2016.
- **Y. Arafat**, I. Dutta, R. Panat, “Highly Stretchable Interconnects for Flexible Electronics Applications” ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (*ASME InterPACK-2015*), *Poster presentation* and Paper No. IPACK2015-48130, pp. V002T02A029 (2015).
- **Y. Arafat**, S. T. Sultana, I. Dutta, R. Panat, “Effect of Organic Additives on textural and structural Changes of Electroplated Tin films”, manuscript under preparation.
- **Y. Arafat**, I. Dutta, R. Panat “Highly Stretchable Interconnects for Flexible Electronics” *Poster presentation*, *MME Day for Students*, School of Mechanical & Materials Engineering, Washington State University.

Teaching Experience

Teaching Assistant

Fall 2014-Present

School of Mechanical & Materials Engineering, Washington State University

- Assisted in teaching classes of 40-65 senior/graduate students in the following courses
Design for Manufacture and Applied Aerodynamics
Modern Manufacturing Strategies Thermal Systems Design
Mechatronics Heat Transfer
- Special efforts were taken to help underrepresented groups while teaching engineering topics by allocating extra office hours and extra help ahead of the exams. This effort generated enthusiasm amongst the students about the complex engineering topics I was teaching.
- Provided significant assistance to students so that they could successfully complete various design and engineering projects (i.e., Autonomous hunter-gatherer Robot, programmable logic controller based bread-cutting simulator etc.). This hands-on experience allowed several of these students to find internships and industry positions.

Honors and Awards

NSF Travel Grant for International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK2015), San Francisco, CA	2015
3 rd Prize, Research Poster Competition, MME day for students, School of Mechanical & Materials Engineering, Washington State University	2015
Organization of Islamic Cooperation (OIC) Full Scholarship for three years towards B.Sc. in Mechanical Engineering	2009-2011
Bangladesh Government Scholarship for Excellent result in Higher Secondary Certificate Examination	2008
Bangladesh Government Scholarship for Excellent result in Secondary School Certificate Examination	2006

Professional Experience

Trainee Operations Support Engineer, Weatherford **Jan-Jul 2014**
Rig 801, Bangladesh Operations

In-field operations engineer for drilling of eight gas wells in Bibiyana, Bangladesh

Project Control Engineer, Pipeliners Limited, Bangladesh **Jan-Dec 2013**

Project-1: "Piping, Mechanical, Insulation & Tie-in Works for Bangladesh Compressor Station Project at Elenga, Bangladesh"

Client: Hyundai Engineering Co. Ltd.

Project-2: "16" Pipeline Installation & Other Related Facilities"

Client: Chevron Bangladesh Block Twelve Ltd.

Industrial Training

Completed a month long comprehensive training sessions at the following companies in Bangladesh **2011**

Palash Urea Fertilizer Factory Ltd. (PUFFL)

Ashuganj Power Station Company Ltd.

Nitol Motors Ltd.

The ACME laboratories Ltd.

Professional Memberships

American Society of Mechanical Engineers (ASME) **2015-2016**

The Institution of Engineers Bangladesh **2013-2014**

Technical Skills

Software

- Programming Language and Simulation Packages: C/C++, MATLAB, Mathematica, ABAQUS
- Design Tools: AutoCAD, Auto Inventor Professional, Solid Works
- Microsoft Office: Word, Excel, PowerPoint, Project
- Other: DFMA product simplification and concurrent costing, Engineering Equation Solver (EES), ImageJ, Ncorr (Digital Image Correlation tool)

Hardware

- Imaging: Optical Microscopy, Scanning Electron Microscopy
- Film Deposition: PVD(DC Magnetron Sputtering), Electroplating
- Electrochemical Analysis: Linear/Cyclic voltammetry
- Film Characterization: White Light Interferometry, Profilometry, Nanoindentation, Energy-dispersive X-ray spectroscopy (EDX), Electron backscatter diffraction(EBSD)

Languages

Bangla: Native

English: Proficient

Arabic: Reading Knowledge

Community Involvement

Secretary, Developing Sustainable Communities (DSC) **Dec 2015-Present**

Washington State University

- Organize monthly volunteering activities i.e., Highway cleanup and track progress of ongoing projects
- Plan and organize events to promote STEM education in local community

References

Rahul Panat, Associate Professor
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Indranath Dutta, Professor
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