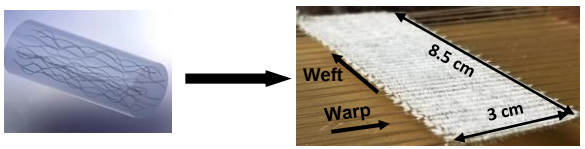
Thermal and Mechanical Characterization of High-Performance Polymer Fabrics for Wearable Device Applications

Faculty: Justin Weibel and Amy Marconnet **Students: Aaditya Candadai, Emily Nadler, Jack Burke**

Objective

Characterize effective thermal conductivity and bending behavior of fabrics constructed from high thermal conductivity polymer fibers

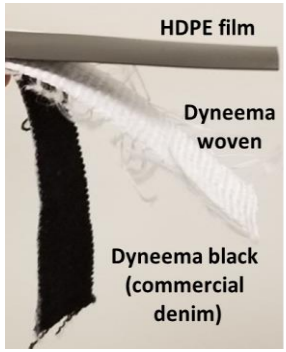
Nano/Micro-Fibers **Macroscale Fabrics**

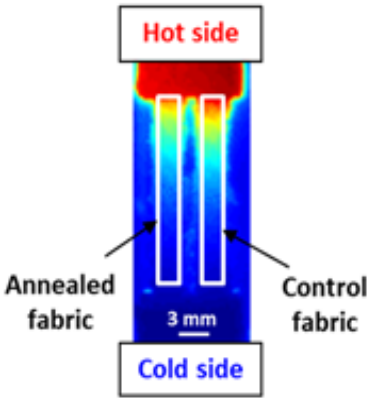


Shen *et al.*, *Nat. Nano.*, 2010.

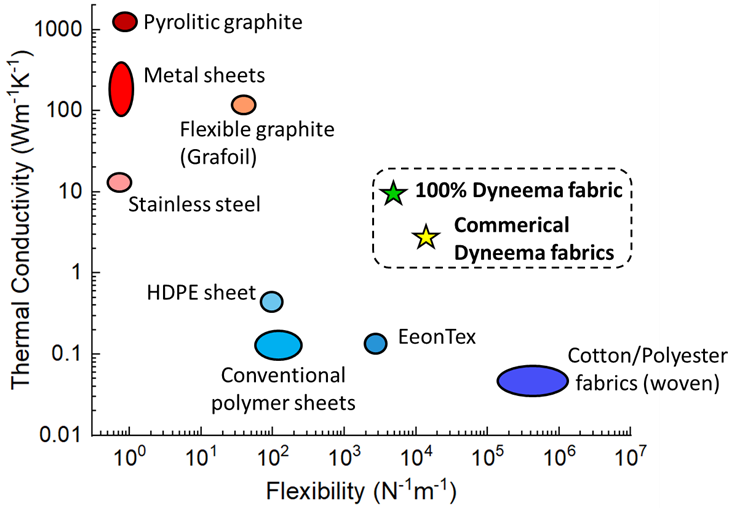
Approach

- Review and identify high thermal conductivity polymer fibers & fabrics
- Measure thermal conductivity (based on IR thermography) and bending stiffness (based on a standard ASTM technique)
- Understand thermal behavior of fabrics when subjected to crease testing and thermal annealing





Assessment of application specific performance metrics for wearable device applications



Dyneema-based fabrics demonstrate high thermal conductivity while retaining good mechanical flexibility

Impact

- Provided a database of high-performance polymer materials
- Characterized the thermal and mechanical properties of commercially available fabric materials
- Assessed application of high conductivity polymers to aid design of flexible/wearable heat spreaders

Publications

A.A. Candadai, E.J. Nadler, J. S. Burke, J.A. Weibel, and A.M. Marconnet, *Sci. Rep., 2020*.

A.A. Candadai, J.A. Weibel, and A.M. Marconnet, *ACS Applied Polymer Materials*, 2, 2020. DOI:10.1021/acsapm.9b00900

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