Weibull Analysis of CNT Network Interphase Thickness in 2D Buckypaper Membrane

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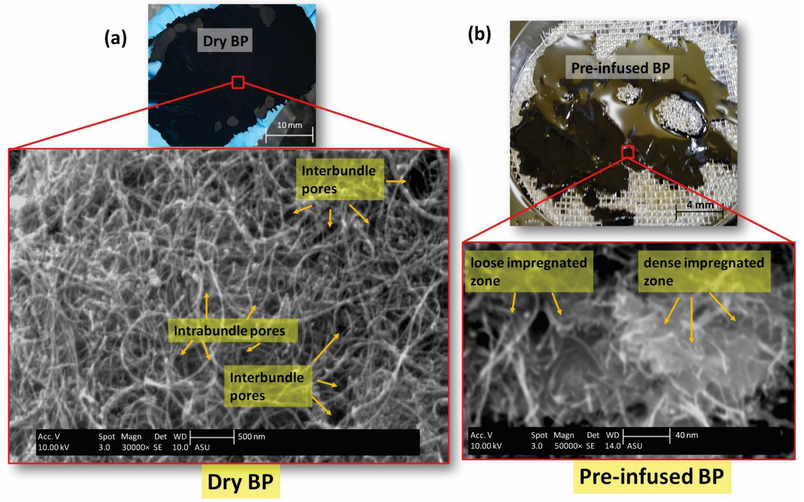
Abstract

The researcher will manufacture a carbon nanotube (CNT) network in a 2D buckypaper membrane. The researcher will use Peak Force Quantitative Nanomechanical Mapping (PFQNM) to measure the interphase thickness between the CNT network and the epoxy resin. Weibull model will be used for a statistical analysis of the interphase thickness.

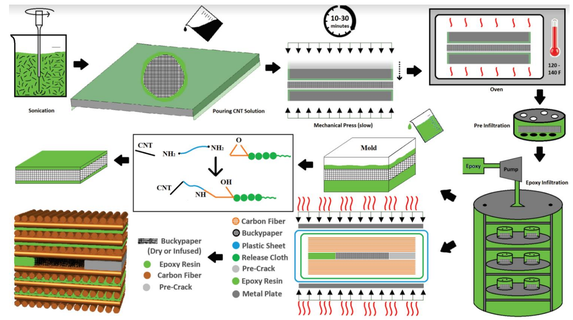
Methodology

-Manufacture CNT networks into buckypaper membrane
-Ultilize PeakForce Quantitative Nanomechanical Mapping (PFQNM) to gather data on interphase thickness
-Perform Weibull analysis to organize data and use linear regression to create an accurate probability function of interphase thickness
-Compare results of dry vs pre-infused CNT networks

Buckypaper Membrane



Manufacturing Process

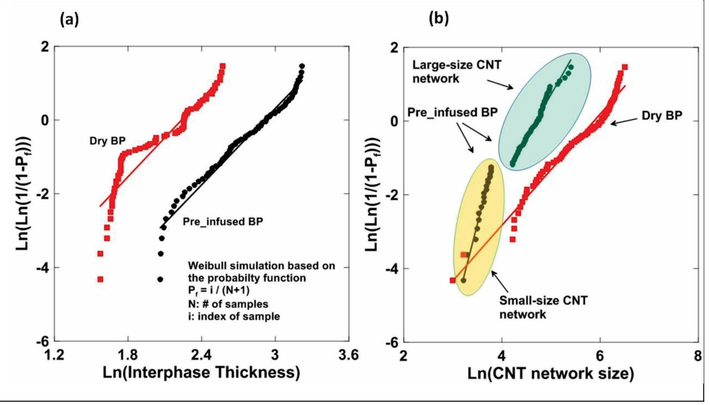


Next Steps

- Perform FE analysis to understand the convolution of the stress state due to substrate effect and interphase of the dispersed carbon nanotube

Weibull Analysis

- Blue area represents interbundle pores (65 - 100 nm)
- Yellow area represents intrabundle pores (20 - 35 nm)
- A larger slope means there is less variability
- Dry and pre-infused buckypaper have the same slope in the interphase thickness graph
- The data on the interphase graph strays from the regression line as the interphase thickness lessens



Accomplishments

Yekani Fard, M., Perrino, S., and Hedman, C. “Stochastic analysis of the carbon nanotube network interphase in dry and pre-infused buckypaper,” ASME 2022 International Mechanical Engineering Congress and Exposition, October 30 – November 03, 2022, Columbus, Ohio, U.S.A.

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