Statistical Analysis of the Network Properties of Multiwalled Carbon Nanotubes in Low Weight Percentage Nanocomposites

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Introduction

Carbon nanotubes are being utilized extensively in recent times due to their electrical conductivity, exceptional mechanical properties, and stability. This research aims to study the CNT network properties and interphase in low weight percentage nanocomposites using AFM based PFQNM and analyze the data using the Weibull analysis model.

Methodology

AFM based PFQNM is an extension of the peak force tapping mode. Peak Force Quantitative Nanomechanical Mapping (PFQNM) can be employed to characterize several interphase properties at the nano and sub nanoscales. PFQNM is superior to other techniques due to its accurate force control and gentle tapping.

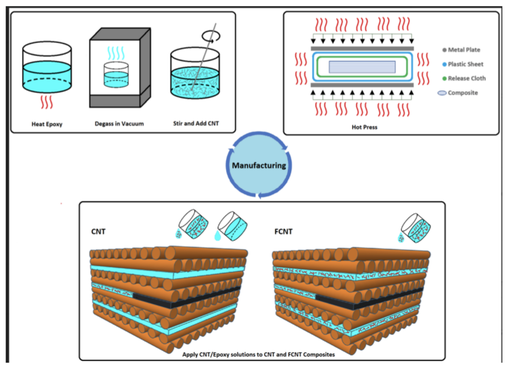

Figure 1: Mixing CNT and epoxy

Results

Figure 1 shows the application of the CNT and epoxy solutions to the composites. The interaction that occurs between the CNT network and the surrounding polymer takes place through the interphase with contrasting morphology and properties as compared to the bulk matrix. Figure 2 shows the variance in the adhesion and modulus of CNT network and polymer. The transition zone (interphase between the polymer and CNT network) can be viewed in this figure. The width of the interphase depends on the location, presence of moisture, expansion etc. However, the modulus is not massively affected by these factors.

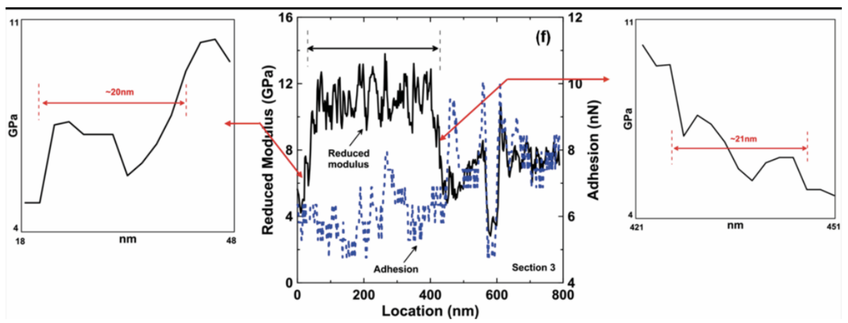

Figure 2 : Adhesion and Modulus

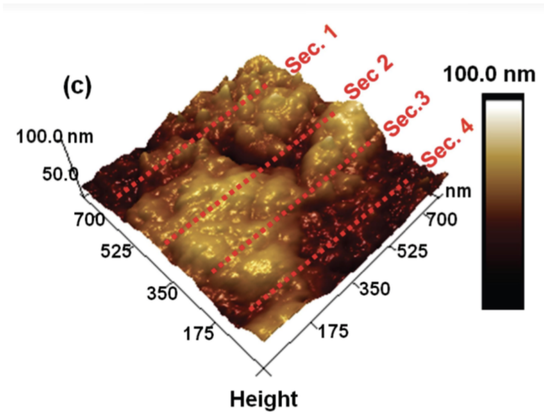

Figure 3: 3D map to study features

Acknowledgements

I would like to thank Dr. Yekani Fard and FURI for giving me the opportunity to pursue this research project.

FURI

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