MATERIALS ENGINEERING

SEMINAR

"Fundamentals of Polymer Blend Nanocomposites for Thermal Interface Materials"

By

Geeta Pokhrel

Purdue MSE Preliminary Exam

Advisors: Professor Chelsea Davis and Professor John Howarter

ABSTRACT

Thermal Interface Materials (TIMs) are exposed to harsh temperature, environmental, and mechanical conditions that lead to failure, hindering efficient thermal conduction. Both thermal and mechanical properties are equally important for device reliability and performance. This study emphasizes fabricating TIMs based on polymer blend nanocomposites (PBNCs) with mechanical robustness and sufficient thermal conductivity. Prior work at Purdue led to a foundation on mechanically robust thin films using bicontinuous polymer blends that are highly immiscible i.e., polystyrene (PS) and polyisoprene (PI). PS and PI are glassy and rubbery polymers respectively. Imparting thermally conductive nanofillers in the mechanically robust polymer blend thin films is our approach to function as TIMs. Preliminary results were obtained by using gold (Au) nanofillers in the PS/PI blend thin films. Au nanoparticles of different volume % (up to 5%) and sizes (15 nm and 50 nm) were added to the PS/PI blend. The thin films were fabricated through spin coating. Transmission Electron Microscope (TEM) was used to observe the dispersion of nanofillers and their localization in the blend. The results showed Au nanoparticles were dispersed in both polymer phases and required a high loading percentage to form a thermal conduction path. These results provided a systematic approach to optimize sample preparation, and morphology characterization across different length scales.

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Place: HAMP 2107 or via Zoom https://purdue-edu.zoom.us/my/chelseadavis