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Tuning the Hydrophobic Nature of CNT Arrays with Micro-Patterning

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Abstract

Our research reports the effects of micro-patterning on the hydrophobicity of vertically aligned multi-walled carbon nanotubes (MWCNTs). It draws inspiration from nature to mimic the hydrophobicity of lotus leaves due to its micro papillae. Micro-ridges with different dimensions were patterned onto MWCNTs using a laser pruning technique. In order to investigate the changes in both the micro-patterns and the contact angle (CA) of water droplets as they evaporate, a real-time dynamic study was developed in the course of our research. When droplets landed on fewer micro-ridges, a larger CA was observed, corresponding to higher hydrophobicity. Scanning Electron Microscope (SEM) imaging showed that the shrinking of the micro-ridges caused the samples to become defunct, which is influenced by the width of micro-ridges and channels. An ideal ratio of the micro-ridge to channel width is proposed to increase hydrophobicity. The findings from our project could serve as value-add for further developments in creating more useful hydrophobic surfaces. These hydrophobic surfaces could be useful when implemented on sea vessels as they could reduce the drag force experienced by the vessels, which would in turn be more fuel efficient.

評語

This is an interesting study. The effects of interests were studied in detail, and the presentation was well done.