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Dependence of mechanical properties on SWNT dispersion for shear-flow gel-spun PAN/ SWNT composite fibers

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A shear-flow gel-spinning approach was utilized to produce polyacrylonitrile (PAN)-based composite fiber with high concentration (>10wt %) of single-wall carbon nanotubes (SWNT). Computational fluid dynamics methods were also used to analysis the stability of the shear-flow gel-spinning system to improve as-spun fiber uniformity. The effect of SWNT dispersion quality in the spinning dope is examined with respect to themorphology and mechanical properties of the resultant composite fibers. A thermal charring process was performed on different composite fibers to visualize the SWNT dispersion quality in the fibers. Fibers were identified with low, intermediate, and high SWNT dispersion quality. Wide-angle X-ray diffraction data suggests that as the SWNT dispersion quality increases, the composite fiber crystallinity and crystal size for major crystallization planes increases. Compared to the fibers with low SWNT dispersion quality, the tensile modulus and strength of the composite fibers with intermediate SWNT dispersion were improved by 43% and 90%, respectively. As compared to the intermediate case, the fibers with high SWNT dispersion quality showed that both modulus and strength values were further improved by 76% and 69%, respectively. These results are presented and discussed in this poster.

Biography

Jiangsha Meng is a Ph.D. candidate at Northeastern University, college of engineering. He is currently a graduate research assistant in Macromolecular Innovations in Nanomaterial Utilizing Systems Lab. To date, he has published four peer reviewed journal articles and presented three conference papers and posters.

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