Influence of MWCNTs in Improving the Optical, DC conductivity and Mechanical Properties of CMC/PAAM Blends

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Abstract

Enhancing the optical, electrical and mechanical properties of polymeric materials, by blending with another material and doping with nano-fillers, is crucial for improving their performance in optoelectronic, biological and medical applications. In this work, the influence of adding multi-walled carbon nanotubes (MWCNTs) on the physical properties of carboxymethyl cellulose (CMC)/ polyacrylamide (PAAM) blends is reported. Scanning electron microscopy was used for investigating films' surface morphology and revealed good distribution of MWCNTs on the blend surface. UV-vis-IR spectroscopy showed that absorption and refractive indices, and other dispersion parameters could be controlled by adjusting the films' compositions. Loading 2 *wt.%* MWCNTs narrowed the optical bandgap of the blend from 5.1 to 4.1 eV. Doping with MWCNTs raised the dc conductivity by about two orders of magnitude by forming 3D pathways within the blend matrix. The storage modulus increased with MWCNTs loading by 39.3% for the 2 *wt.%* ratio while decreasing with increasing temperature.

Keywords: Carboxymethyl cellulose; Polyacrylamide; Blends; Dynamic Mechanical Analysis.