KN-12-824

Friday, May 13, 2011, 10:30-11:10 am
Room: Fez 2

AC ELECTRIC FIELD MANIPULATION OF CELLULOSE WHISKERS IN POLYVINYL ACETATE

Sanjay Kalidindi[1] , Zoubeida Ounaies [1], Hamid Kaddami [2]
[1]Texas A&M University, [2]University of Cadi-Ayyad
svkalidindi@tamu.edu

Naturally available cellulose whiskers (CWs) as reinforcing particles have shown a lot of promise due to their inherent mechanical and piezoelectric properties. Researchers have looked into reinforcing polymers with CWs. Usually, a relatively high content is added to realize improvement, for example adding 16wt% CWs to a latex polymer resulted in 400% improvement in storage modulus [Favier et al, 1995 Macromolecules]. This enhancement in modulus is usually followed by a modest increase in strength but generally the ductility and toughness decrease. Our approach is to use small concentrations of CWs so as not to detrimentally affect toughness and ductility; by aligning the small amounts of CWs, we target the same kind of improvement in modulus and strength as reported in literature. In this work, we investigate the effect of AC electric field on the alignment of nanoscale dispersed CW in a polymer. PVAc is used as model polymer because of the good interaction between CWs and PVAc. Following alignment, the CW/PVAc nanocomposites are thermally cured in the presence of electric field to maintain the aligned microstructure. A modified method was used to disperse the CWs in PVAc. CWs were individually dispersed with average lengths and diameters of 260 nm and 8 nm respectively yielding an aspect ratio of approximately 30. Alignment and chain formation were found to be a function of applied electric field magnitude, frequency and duration. Improvements in dielectric constant and storage modulus were observed for the aligned cases as compared to random case and pure PVAc. Future work will focus on further characterizing the aligned composites and understanding the mechanism that drives alignment and enhanced properties.