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B.k Khatiwada
University of Ozarks

ROLE OF INTERFACES IN POLYMER MATRIX COMPOSITES AND METHODOLOGIES TO IMPROVE AND CHARACTERIZE INTERFACES IN COMPOSITES

B. K. Khatiwada*, K. Bastola**, K. Mishra***, F. Blum**** and R. Vaidyanathan***
*Department of Chemistry, University of Ozarks, Clarksville, AK
**Department of Grain Size and Industry, Kansas State University, KS
***Helmerich Research Center, Oklahoma State University, Tulsa, OK
****Department of Chemistry, Oklahoma State University, OK

Interfaces in composite materials play disproportionate roles in the ultimate physical properties in systems where polymers are used. Generally, the adsorption of polymers on solid substrates changes the behavior of the polymers at the interface. These changes can be dramatic and have major effects on the mechanical and chemical properties of the composite materials. The distance scales over which these changes occur are small, even as small as 10 nm or less (often less than the unperturbed radius of the molecule) and it is difficult to use many standard techniques to study them. The focus of the work presented here relates to the behavior of graphene oxide (GO) as a potential reinforcing nanomaterial for interlaminar toughening and improved barrier properties of carbon-fiber composites through modeling and experimentation. GO is an oxidized form of graphene where the carbon is modified through the addition of the oxygen-containing polar groups, mainly carboxyls and carbonyls. The increase in interlaminar fracture toughness was observed at least one order of magnitude lower amount of nanoparticle additions compared to what has been reported in literature. This result will be discussed in terms of XRD and DSC, where it was observed that there was significant increase in glass transition temperature as well as a broadening of the glass transition peak.