Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Novel Approach to Quantify Dispersion of Spherical Nanoparticles in Polymer Nanocomposites[1] DENIZ RENDE, NIHAT BAYSAL, RAHMI OZISIK, Rensselaer Polytechnic Institute — Nanocomposites have emerged as promising materials due to improved conductivity, toughness, and permeability when compared to conventional bulk polymers. Controlling the dispersion of the nanoparticles in a polymer matrix is still one of the greatest challenges that limit our ability to achieve the aforementioned property enhancements. Nanoparticles tend to agglomerate due to strong interparticle interactions. The dispersion of nanoparticles in polymers is generally determined by transmission electron microscopy (TEM) or scanning electron microscopy (SEM). However, in these studies quantification of dispersion depends on the visual observations and is prone to subjective conclusions; thereby hampering possible comparison between samples. Considering its importance, little effort has been put forward to quantify the dispersion of nanoparticles in polymers. In the current study, we have applied network theory approach to quantify the dispersion of spherical particles. A network is a collection of nodes, which are entities (such as nanoparticles), and edges that connect pairs of nodes (distances between nanoparticles). By employing nodes and edges, we constructed interaction networks, which were then analyzed in terms of global topological measures: degree distribution, clustering coefficient, and average distance. We show that this approach is a powerful tool to quantify dispersion of spherical nanoparticles in a polymer matrix.

[1]Partial support was provided by NSF Grant No. 1003574 and RPI. DR is also supported by TUBITAK 2219 program.

Rahmi Ozisik
Rensselaer Polytechnic Institute

Date submitted: 11 Nov 2011 Electronic form version 1.4