Supplementary Materials for
Percolation Behavior of Electrically Conductive Graphene
Nanoplatelets/Polymer Nanocomposites: Theory and Experiment

İbrahim Mutlay, Lucian Barbu Tudoran

February 26, 2012

Figure S 1: Percolation threshold versus aspect ratio of bulk carbon materials. Solid lines are *Eq. 8*, data points are collected from literature [1-5]. Titles of circles correspond to components of the composite systems. κ is varied one by one incrementally from 1 to 5. Acronyms are as follows: EG, expanded graphite; CB, carbon black; HDPE, high density polyethylene; PMMA, poly(methyl methacrylate); PP, polypropylene; PC, polycarbonate; PS, polystyrene; NR, natural rubber; BR, butyl rubber; PE-MA-PE, polyethylene/maleic anhydride grafted polyethylene blend; PA6, polyamide 6.

Figure S 2: Weak correlation between κ and ε .

Figure S 3: XPS C1s spectra (above) and O1s spectra (bottom) of P-GNPs.

Figure S 4: SEM image of P-GNPs for the evaluation of morphology at macroscale indicating uniform distribution.

Figure S 5: SEM image of V-GNPs for the evaluation of morphology at macroscale indicating uniform distribution.

Figure S 6: SEM image of B-GNPs for the evaluation of morphology at macroscale indicating uniform distribution.

Figure S 7: SEM image of -325 mesh amorphous bulk graphite powder for the evaluation of morphology at macroscale indicating irregular and large particles.

References

- [1] Yang, Q. Q., Liang, J. Z. (2008) A percolation model for insulator-metal transition in polymer-conductor composites. *Appl. Phys. Lett.*, 93: 131918.
- [2] Savchenko, D. V., Ionov, S. G. (2010) Physical properties of carbon composite materials with low percolation threshold. *J. Phys. Chem. Solids*, 71: 548-550.
- [3] Zheng, W., Lu, X., Wong, S.-C. (2004) Electrical and Mechanical Properties of Expanded Graphite-Reinforced High-Density Polyethylene. *J. Appl. Polym. Sci.*, 91: 2781-2788.
- [4] Pötschke, P., Abdel-Goad, M., Pegel, S., Jehnichen, D., Mark, J. E., Zhou, D., Heinrich, G. (2010) Comparisons Among Electrical and Rheological Properties of Melt-Mixed Composites Containing Various Carbon Nanostructures. *J. Macromol. Sci. A*, 47: 12-19.
- [5] Zheng, W., Wong, S.-C. (2003) Electrical conductivity and dielectric properties of PMMA/expanded graphite composites, *Compos. Sci. Technol.*, 63: 225-235.