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Improved mechanical, thermal and flame-resistant properties of PC/ABS/ montmorillonite nanocomposites

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Blends of polycarbonate (PC) and Acrylonitrile-butadiene-styrene (ABS) have a wide range of applications in various industries, such as automotive, machinery, electronics, and communication. In this study, PC/ABS extensively used in electronics and electrical equipment were used as the matrix to prepare composite materials. Environmentally-friendly inorganic flame retardants (magnesium hydroxide (MH) and a halogen-free phosphorus flame retardant additive (bisphenol A bis(diphenylphosphate)(BDP)) were added to PC/ABS. Layered silicate (montmorillonite (MMT)) was added to make nanocomposites. We used a high temperature type banbury mixer to prepare PC/ABS/MH/BDP/OMMT nanocomposites, which were characterized by various analytical techniques. The XRD results showed expansion in the distance between layers of MMT from 1.28 to 1.8 nm. The 5 types of prepared PC/ABS nanocomposites did not reveal characteristic peaks of MMT between 3° and 6° indicating that MMT dispersed in the nanocomposites. The thermal analysis indicated that either MH or BDP contributes to an increase in the char residue; adding two materials together provide a synergistic effect through increasing the char residue. The LOI value rose to 29 when two flame retardants were added, significantly higher than the LOI values when only one of the materials was used.

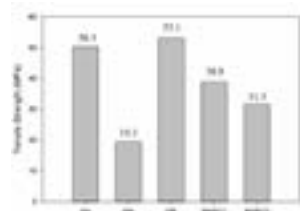


Figure 1: Tensile strengths of PC/ABS nanocomposites.

Recent Publications

1. S S Hwang (2016) Tensile, electrical conductivity and EMI shielding properties of solid and foamed PBT/carbon fiber composites. *Composites Part B Engineering*. 98. Doi: 10.1016/j.compositesb.2016.05.028.
2. W R Jong, S S Hwang, M C Tsai C C Wu, Effect of gas counter pressure (GCP) on shrinkage and residual stress for injection molding process. *Journal of Polymer Engineering*. 37(5):505-520.
3. M K Chang, S S Hwang, S P Liu (2014) Flame retardancy and thermal stability of ethylene-vinyl acetate copolymer nanocomposites with alumina trihydrate and montmorillonite. *Journal of Industrial & Engineering Chemistry*. 20(4):1596-1601.
4. S S Hwang, Peming Hsu (2013) Effects of silica particle size on the structure and properties of polypropylene/silica composites foams. *Journal of Industrial & Engineering Chemistry*. 19(4):1377-1383.
5. S C Chen, P S Hsu, Shyh Shin Hwang (2013) The effects of gas counter pressure and mold temperature variation on the surface quality and morphology of the microcellular polystyrene foams. *Journal of Applied Polymer Science*. 127(6):4769-4776.

Biography

Shyh Shin Hwang is a Professor of Mechanical Engineering, Chien Hsin University of Science and Technology, Taiwan, and is in charge of the precise injection molding laboratory. He received his BS in Mechanical Engineering (Feng-Chia University, Taiwan), MS in Mechanical Engineering (Northeastern University, Boston, MA), and PhD in Mechanical Engineering from University of Rochester, Rochester, NY, USA. His research area is related to the microcellular, polymer/clay nanocomposites foam, over-molding, gas-counter pressure process, and water-assisted injection molding process.

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