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Engineering Flame Retardant Biodegradable Nanocomposites[1]
SHAN HE, KAI YANG, YICHEN GUO, LINXI ZHANG, SEONGCHAN PACK, SUNY, Stony Brook University, RACHEL DAVIS, Massachusetts Institute of Technology, MENAHEM LEWIN, Polytechnic Institute of New York University, HARALD ADE, Department of Physics, North Carolina State University, CHAD KORACH, SUNY, Stony Brook University, TAKASHI KASHIWAGI, Fire Research Division, National Institute of Standards and Technology, Gaithersburg, MIRIAM RAFAILOVICH, SUNY, Stony Brook University — Cellulose-based PLA/PBAT polymer blends can potentially be a promising class of biodegradable nanocomposites. Adding cellulose fiber reinforcement can improve mechanical properties of biodegradable plastics, but homogeneously dispersing hydrophilic cellulose in the hydrophobic polymer matrix poses a significant challenge. We here show that resorcinol diphenyl phosphates (RDP) can be used to modify the surface energy, not only reducing phase separation between two polymer kinds but also allowing the cellulose particles and the Halloysite clay to be easily dispersed within polymer matrices to achieve synergy effect using melt blending. Here in this study we describe the use of cellulose fiber and Halloysite clay, coated with RDP surfactant, in producing the flame retardant polymer blends of PBAT(Ecoflex) and PLA which can pass the stringent UL-94 V0 test. We also utilized FTIR, SEM and AFM nanoindentation to elucidate the role RDP plays in improving the compatibility of biodegradable polymers, and to determine structure property of chars that resulted in composites that could have optimized mechanical and thermal properties.

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