

Characterizing Particle Emissions from Burning Polymer Nanocomposites

Marc R. Nyden

*Building and Fire Research Laboratory, National Institute of Standards and Technology,
100 Bureau Drive, Mail Stop 8652, Gaithersburg, MD 20899, marc.nyden@nist.gov*

Engineered nanoparticles, such as carbon nanotubes (CNTs) and nanofibers (CNFs) are increasingly being used as fire retardants and performance additives in polymeric materials. However, because of their small size and ability to interact with biological molecules, these nanoadditives may pose significant health and environmental risks if they are released into the environment. Although it is unlikely that encapsulated nanostructures will be released when the materials containing them are used in protected, indoor environments, this risk becomes more significant when these materials are exposed to fire (either unintended or during incineration) or other forms of intense energy (e.g., sunlight) when they are disposed of in landfills. The nanoparticulate morphologies generated in this way may be vastly different than those adopted by the pristine nanostructures due to agglomeration and interactions with other decomposition products and may pose significant new health risks.

In an effort to gain a better understanding of the potential hazards associated with the commercialization of polymer nanocomposites, we have undertaken an investigation into the nature of the particles released when these materials are burned. Some of the questions we hope to answer are: 1) Do nanocomposite materials release significant amounts of nanoparticles (in addition to soot, which is a ubiquitous byproduct of gas phase combustion) when they are burned? 2) If so, under what circumstances are these nanoparticles emitted and 3) Are the size distributions, morphologies, and chemistries of the released nanoparticles different from what they were in the nanocomposite?