

WILLIAM MAXWELL REED

MECHANICAL ENGINEERING SEMINAR

THERMAL AND FLAMMABILITY PROPERTIES OF POLYMER NANOCOMPOSITES— EFFECTS OF SHAPE OF NANOPARTICLES

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ABSTRACT

Nanocomposites based on three different shapes of nanoscale particles, sphere (silica), plate (clay), and tube (carbon nanotube), were prepared and the dispersion of the particles in the nanocomposites was confirmed by various techniques using TEM, SEM, optical microscopy, and XRD. Their flammability properties were measured by using a Cone calorimeter and a radiative gasification apparatus in nitrogen. The residues of these nanocomposites after the gasification test were collected and the shape and the structure of the residues were examined. The results show that the reduction in heat release rate is achieved in the order: carbon nanotubes, clay platelets, and silica spheres providing that these particles are well dispersed in the sample. It appears that the particles having higher aspect ratio tend to form an effective protective layer consisting of network-structured floccule which covers the entire sample surface without forming any cracks during burning. The formation of such a layer is critical to obtain low heat release rate from nanocomposites.

Biographical Sketch

Takashi Kashiwagi received his B.S. and M.S. from Keio University in Mechanical Engineering in 1963 and 1965, respectively. He received his Ph.D. from Princeton University in Aerospace and Mechanical Science in 1971. He began working with the National Bureau of Standards (NBS) Fire Science Division (Materials Research group) in 1971 and retired in 2001. Since 2001, he is a Guest Researcher at the National Institute of Standards and Technology (formerly NBS) and a Research Associate at the University of Maryland (Department of Fire Prevention Engineering). Dr. Kashiwagi's research topics include combustion mechanism of polymeric materials, flammability mechanisms of nanocomposites, ignition and flame spread in microgravity.

DATE: Thursday, April 1, 2004
TIME: 3:30 (Refreshments at 3:00)
PLACE: 323 CRMS

This presentation is also part of the NANO-SCALE ENGINEERING CERTIFICATE PROGRAM Seminar Series.

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Attendance open to all interested persons



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