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Preface

This issue of *Polymer Engineering and Science (PES)* contains selected papers presented during the Third International Symposium on Polymeric Nanocomposites (PNCs), held at the Industrial Materials Institute (IMI) of the National Research Council of Canada (NRCC) in Boucherville, Quebec, Canada on September 28–30, 2005. Papers from the first two Symposia were published in *PES*, Vol. 42, No. 9 (September 2002), and Vol. 44, Nos. 6 and 7 (June and July 2004). During the 2 years since the last symposium, PNC technology has made significant inroads into markets in a variety of applications that are indicated in the following paragraphs.

Automotive Applications

Since 2002, GM has been using clay–polymer nanocomposite (CPNC) as body side moldings for the Chevrolet Impala and a load floor in the Hummer H2 (TPO-clay formulation). PP-based CPNC are used for seat backs of the Acura TL and for interior consoles of light trucks. Unitika produces PA-6/synthetic clay PNC for covers of car engines and converters for Mitsubishi and Toyota. The same PNC is also used for injection molding of rigid bases for the electronic control trays and covers. Ube PNC has been used for the fuel system, rear mirror housing, and timing belt cover. In 2004, Pirelli announced the first application of rubber-based PNC in winter tires.

Packaging Applications

Eastman developed PET bottles with improved barrier properties for carbonated soft drinks or alcoholic beverages by incorporating a middle layer of semiaromatic PA-based PNC to reduce gas diffusion. A similar technology has been developed in Europe. Bayer, Clariant, Honeywell, Mitsubishi Gas, and several others produce transparent PNC films

and thermoformed containers for food packaging with low-oxygen transmission rates. Nanocomposite concentrates are being evaluated in films not only for enhancing barrier properties, but also to control the migration of additives, such as biocides and dyes.

Other Applications

Rohm and Haas developed pressure sensitive adhesives containing 2-wt% organoclays with superior tensile strength and balanced performance. Kabelwerk Eupen uses EVAc/organoclay for wire and cable that has reduced heat release in flammability tests. Similarly, Siemens AG is developing low-flammability PNCs for electrical applications. Also, Showa Denko produces PA-66 and POM nanocomposites for improved flame retardancy and rigidity. Yantai Haili manufactures earthquake-resistant pipes from PNC based on UHMWPE. Wilson Sports introduced long-life tennis balls with internal CPNC coatings. The technology is to be used for the manufacture of diverse balls, and tires.

The 3-day Symposium at IMI comprised a 1-day workshop and 2 days of scientific oral and poster presentations. The meeting was well-attended with participants from 16 countries on four continents. The Fourth International Symposium on Polymeric Nanocomposites (PNC-2007) is already being prepared for the fall of 2007. The workshop provided basic information on PNC thermodynamics and rheology, on their compounding, processing, and characterization. Applications of PNCs in the automotive, packaging, and foam industries were also discussed. PNC technology is growing at a healthy rate of about 18% per annum. However, the rate is expected to increase once melt compounding technology shifts PNC manufacturing from reactors to conventional plastics processing equipment. The development of extensional flow mixing, discussed during the Symposium, is a significant step in that direction. The 17 papers selected for this special *PES* issue represent noteworthy examples of contemporary PNC research and applications.

Guest Editors

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