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Preface

Synthetic Polymer-Polymer Composites

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Preface

The awareness about adverse environmental impacts of synthetic, petroleum-based polymers is steadily increasing and has already caused some worldwide concern. What is more, this concern is ascending because of the use of synthetic polymers is increasing rather than decreasing. A good example in this respect is the usage of poly(ethylene terephthalate) (PET) whose production has an annual growth of 10%, mostly due to its excellent properties as packaging material for various products that include pressurized beverages, food articles and medicines. The expected future growth is strongly supported by the fact that a large percentage of food products is often wasted because of bad or lack of packaging. In their efforts to change the situation, many countries, such as China and India, are likely to increase the usage of plastics packaging containers. However, in many countries legislations are introduced to control the amount of plastics used. For example, in the European Union, it will be not allowed after 2015 to use in the cars manufacturing plastics having more than 5 wt% incineration quota*.

A decade or so ago, researchers believed that the commonly used polymer composites, comprising about 30% glass fibers, would be replaced by nanocomposites having only 2 to 5 wt% nano-sized materials as reinforcement. Unfortunately, this expectation has turned out to be somewhat elusive and researchers have started to look for alternative ways of replacing the traditional glass fibers with natural, biodegradable materials, mostly with fibrous structure. The potential of this approach has been demonstrated in our book entitled *Engineering Biopolymers: Homopolymers, Blends and Composites* (Hanser Publication, 2007).

In this book we show another approach for replacing glass and other inorganic fibers as reinforcements for polymer composites. This replacement could be again synthetic, petroleum-based polymer but prepared as fibers, micro- or nanofibrils. Of course, this approach is not as advantageous as using natural fibers that are biodegradable and eco-friendly. At the same time, the synthetic polymer-polymer composites seem to be much more acceptable from the environmental point of view because they, being organic in

* A. Bismarck *et al.*, Plant fibres as reinforcement for green composites, in *Natural Fibres, Biopolymers, and Biocomposites* (Eds. A. Mohanty, M. Misra and L. T. Drzal) CRC/Taylor & Francis, 2005, pp. 37–108.

nature, are prone to incineration process. In addition to their environmental advantages, compared to the polymer composites with mineral reinforcements with high weight/volume fractions, they are likely to possess much better specific mechanical properties. This positive attribute allows them to be used to manufacture lightweight products and structures, a fact that has particular importance in the transportation and packaging industries.

This book is an attempt to collate information from a group internationally known researchers and demonstrate the state-of-the-art applications of synthetic, but organic in nature, materials as carbon fibers, carbon nanotubes, synthetic polymers in the forms of fibers, and micro-/nanofibrils as replacements of mineral reinforcements. We would like to thank all the contributors for their willingness to participate in this exercise and being patient during the compilation work. The editors also wish to thank the Centre for Advanced Composite Materials, University of Auckland for providing a range of facilities and the Ministry of Science and Innovation, New Zealand for financially supporting Dr. Fakirov.

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