Editorial corner – a personal view

Electrical properties of polymer matrix composites: current impact and future trends

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It is more than 30 years since polymer matrix composites became an important class of engineering materials. The enormous growth of composite technology was based on their superior mechanical performance, light weight, and cost effectiveness. During all these years thorough studies were focused on manufacturing, thermal and mechanical behaviour initially of micro- and recently of nanocomposites. The electrical performance of these systems came into play with a significant delay. Although this delay can be considered as a historical perspective of materials science, the importance of electrical properties is remarkable. Materials can be classified to conductors and dielectrics (insulators and semiconductors) through their conductivity. Our civilization is based on this property, or in other words is based on materials which easily permit the charge carriers migration or to others which prohibit it. It is difficult to imagine personal and professional life without the safe and convenient distribution of electric power.

Since polymer matrix composites are basically electrical insulators, their primary applications result from this property and combine flexibility, ease processing, light weight, shock resistance and environmental stability. Sequentially, the development of conductive systems and moreover the ability to tailor electrical performance by switching from insulating to conductive behaviour opened new fields for technological applications, such as electromagnetic interference shielding, static dissi-

pative plastics, conductive coatings or adhesives and memory switchers. The evolution of polymer nanocomposites started a new round of challenges and possibilities. Electrical behaviour is now governed by a small amount of the nanofiller, while the systems performance is improved. Forthcoming technological changes comprise ‘printing’ circuits in nanoelectronics, transmission lines and energy storing devices. The so called ‘all polymer cable’ consisted by a single polymer system, able to transmit signals and transport power and at the same time protect and insulate the carrying line, as well as ‘structural batteries’ where nanoinclusions can act as energy storing devices are not far away. Last but not least, studies on the electrical properties of polymer nanocomposites accumulate valuable knowledge for their structure-properties relationships and related phenomena in nanoscale, opening new opportunities for high-tech applications.

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