Modern technology continuously requires new, enhanced materials with special combinations of properties. In recent years, researchers have managed to develop new materials at the nanoscale with excellent combinations of properties. These new materials, called nanocomposites, possess enhanced properties and promise to soon replace classical materials used in industry. With nanoclay minerals, it becomes possible to create plastics, for instance, that are not only stronger and lighter, but are also scratch, ultraviolet and fire-resistant. This enables various advanced modern uses for plastics, such as lighter, stronger plastic parts for motor vehicles. Another application is using enhanced plastics for meat and other food packaging. Traditionally packaging plastic is made up of up to nine thin layers. With nanocomposite plastics, only three layers are needed which dramatically reduces the amount of plastic required. During nanocomposite formulation, nano-level dispersion is the most important characteristic to achieve, in order to have increased surface area for polymer-filler interaction, improved co-operative phenomena among dispersed particles, and/or a higher degree of confinement effects. However, the primary challenge is to find the right chemistry to provide the best favorable driving force to disperse fillers at a nano-level. What this means is that one needs to determine the right temperature, pressure and environmental conditions needed to successfully and optimally allow a nanoclay to mix with a polymer. The DST-CSIR Nanocentre's work in nanoclay minerals focuses primarily on South African nanoclay mineral-enhanced plastics and efforts to create awareness of polymer nanocomposites (PNCs) in industry as well as the development of products that will benefit the industry. The DST-CSIR Nanocentre is also putting further research efforts into processing and characterization techniques, properties and applications, and key research challenges and future outlooks in the development of South African nanoclay minerals-based multifunctional PNCs.

Biography

Suprakas Sinha Ray was born in 1973 in India and completed his PhD studies at the University of Calcutta in 2001, and then postdoctoral fellow at Toyota Technological Institute and Laval University studying the structure-property relationship in nanoclay-containing polymer nanocomposites. He started working on fundamental understanding to real applications of polymer-based nanostructured materials when he joined the CSIR as a group leader. These studies advanced and broadened when he appointed as a chief researcher and director of the DST-CSIR National Centre for Nanostructured Materials and growing to the present time with postdoctoral fellows, students, collaborators and industrial partners worldwide. Currently, more than 80 researchers, engineers and technologists are working with him. Prof. Ray is one of the most active and highly cited authors (his articles have been cited more than 14700 times, google scholar, h factor 44), in the field of polymer nanocomposite materials and his work has been featured on various international journal cover pages on 14 different occasions. He is the author of 2 books, co-author of 3 edited books, 15 book chapters on various aspects of polymer-based nano-structured materials & their applications, and author and co-author of 250 articles. He also has 4 patents and 7 new demonstrated technologies shared with colleagues, collaborators and industrial partners. His team also commercialized 16 different grades of polylactide nanocomposites.

rsuprakas@csir.co.za