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POLYMERIC NANOCOMPOSITES: AN OVERVIEW FROM SCIENCE TO TECHNOLOGY

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A decade of research has shown that nanostructured materials have the potential to significantly impact growth at every level of the world economy in the 21st century. This new class of materials is now being introduced in structural applications, such as gas barrier film, flame retardant product, and other load-bearing applications. Of particular interest is recently developed nano-composites consisting of a polymer and layered silicate because they often exhibit remarkably improved mechanical and various other properties¹ when compared with pure polymer or conventional composites (both micro- and macro-composites). A primary progress in polymer/layered silicate nano-composites, a Nylon 6/layered silicate hybrid² reported by Toyota Central Research & Development Co. Inc. (TCRD), was successfully prepared by in-situ polymerization of ϵ -caprolactam in a dispersion of montmorillonite (MMT). The silicate can be dispersed in liquid monomer or a solution of monomer. It has also been possible to melt-mix polymers with layered silicates, avoiding the use of organic solvents. The latter method permits the use of conventional processing techniques such as injection moulding and extrusion. The extensive literatures in nano-composite research are covered in the recent reviews^{3,4,5}.

Continued progress in nanoscale controlling, as well as an improved understanding of the physicochemical phenomena at the nanometer scale, have contributed to the rapid development of novel nano-composites. This lecture presents current research on polymer/layered filler nano-composites (PLFNCs) with the primary focus of recent advances from basic science to technology.

References

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