# Preface

Due to the layered structure, clay materials have many potential applications. Here, the layered silicates are made-up of silicon and oxygen bonds with some other elements. Incorporation of clays in a polymer to fabricated clay-polymer composite found to provide unique properties to the new materials, which opened many advanced application opportunities. It was observed to provide better absorption, and thermal/mechanical stabilities, carrier mobility, electric, magnetic, and dielectric properties and so on. In this book clay based composites with different synthetic polymers have been covered, which contains 10 state of the art articles covering different aspects of the clay and synthetic polymer based composites and their applications.

Chapter-1: The primary focus of this chapter is the composite formation by in-situ polymerization of hectorite/clay materials. The chapter also covers the application of this composite in different areas, like, food packaging, rheological control agent, wastewater treatment, biomedical applications and drug delivery.

Chapter-2: This chapter is about the use of cost-effective clay-based bio-polymeric composites in a variety of biomedical applications, such as; drug delivery. The main focus is to explore the compositional-structural properties, route of action of clay-based micro and nanocomposites in in-vitro drug delivery system, and administration route of different clay-based composites in drug delivery system

Chapter-3: This chapter primarily focuses on the synthesis, material characterization and testing of nanoclay-based conducting polymeric nanocomposites for electromagnetic interference shielding application. Employing nanoclay is found to improve mechanical strength, dielectric properties, thermal stability, barrier properties and shielding efficiency of nanocomposites through better dispersions and exfoliation of fillers.

Chapter-4: This chapter provides detailed information about the flame retardancy of micro/nano clay polymeric materials. Methods and advantages of the use of micro/nano clay over conventional flame retardant have also been discussed in this chapter. Characterization techniques of polymer micro/nano clay composites have been studied in detail.

Chapter-5: This chapter is designed to be source for nano-clay reinforced thermoplastic nano-composite research, including synthesis, characterization, structure/property relationship and applications considering optical and electrical conductivity of the composite films. Further, the UV-A shielding behaviors of the composite films are also presented.

Chapter-6: This chapter focuses on the application of nano-clay/polymer composites in removal of inorganic, organic pollutants from wastewater. The chapter elucidates characterization, occurrence, types and synthesis of nanoclay polymer composites. The feasibility and efficiencies of few nano clay polymer composites for the removal of specific water pollutants is discussed in detail.

Chapter-7: In this chapter attempts have been made to provide a brief overview of synthesis and applications of nanocomposites based on nontronite, an iron rich smectite clay; starch, a common polysaccharide. Being naturally abundant, affordable, non-toxic and biocompatible, clay-based minerals and biopolymers are advantageous to afford eco-friendly nanocomposites, especially useful for biological applications.

hapter-8: This chapter discusses the numerous approaches for preparing clay-based PET anocomposites as well as their physico-mechanical features, morphological and structural epiction, and crystallization and rheological behavior. In addition, the applications of PET-ased nanocomposites are thoroughly covered in this chapter.

Chapter-9: This chapter deals with various types of fabrication of the polypropylene/clay anocomposites such as extrusion process, solution blending method, melt-blending method, n-situ polymerization method, direct melt compounding, ultra sound-aided extrusion and naster batch dilution. The mechanical, thermal, tribological, optical, creep, hygrothermal, heological and morphological properties of these composites are also discussed.

Chapter-10: This chapter describes the various aspects of polymer nanocomposite synthesized through sonochemical in-situ polymerization intercalation and nanoparticles dispersion. It also explained how the different effects of ultrasound and cavitation improve the thermal, mechanical and electrical properties of polymer nanocomposites even at low filler loadings (<=1.0 wt.%).

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