Processing of Polymer-based Nanocomposites: Introduction

Structural characterization of polymer nanocomposites

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Abstract:

The performance of a heterogeneous material, such as polymer nanocomposites (PNCs) is dictated by three main factors: (i) the inherent properties of the components; (ii) interfacial interactions; and (iii) structure of the PNCs. The structure of a PNC depends on the dispersion and distribution of the nanoparticles (NPs) in the polymer matrix. However, improving the dispersion by mechanical means or via chemical bonding can influence the properties of the obtained PNCs. Therefore, elucidating the dispersion and distribution characteristics and the associated mechanisms is important and can allow prediction of the final properties. This chapter describes the different techniques used to characterize the structure and morphology of various PNCs. Primary techniques include microscopy in real space and reciprocal space, X-ray scattering analysis, as well as indirect measurements to probe the interfacial region and some physical properties. All the techniques mentioned here have certain pros and cons, but complement each other.