



Nanostructured Polymer Blends: Chapter 11. Nano/Micro and Hierarchical Structured Surfaces in Polymer Blends (Micro and Nano Technologies)

Juan Rodríguez-Hernández

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The design of polymer blends constitutes an interesting alternative to obtaining micro- and nanostructured surfaces. The cost is reasonable and it is free from time-consuming procedures. Blending of polymers can yield materials with unprecedented properties that cannot be provided otherwise by using a single polymer. The free surface topography of polymer blend films, often related to phase domain structure, is critical to the applications. Two main aspects need to be considered in the preparation of multistructured blends: the interfaces involved and the morphology to be obtained. The control of these two aspects depends further on materials-related parameters involving the composition of the blend, the interfacial tension or viscosity ratio, and the processing conditions related to the temperature, time, or intensity of mixing, among others. Both domain structure and topography of the blend films have garnered increasing interest over the past decade. This chapter describes the nanomicrostructures formed at the polymer surface from polymer blends. Despite the crucial role that surfaces play in the final application of the material, up to now most of the studies concerning polymer blends have been related to the control of the mechanical properties (toughness, stiffness, thermal expansion, etc.), their barrier properties, or the electrical conductivity. This chapter focuses on the analysis of the structured polymer surfaces and thin films, giving an overview of the role of these structures on the final application. The principles of phase separation and the resulting structures formed are briefly discussed, followed by a wide overview of the possibilities of producing stimuli-responsive interfaces by introducing, among other things, pH- or temperature-responsive polymers within the blend. Finally, we look at how using particular preparation conditions and/or self-assembly of block copolymers, the formation of films and surfaces with hierarchical order length-scales can be induced. We also examine the main areas in which multiscale-ordered interfaces obtained from polymer blends have been applied.

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