NANOSTRUCTURED ARTICLES

Cross Reference To Related Application

This application claims the benefit of U.S. Provisional Patent Application No. 61/452430 filed March 14, 2011, the disclosure of which is incorporated by reference herein in its entirety.

Background

[0001] When light travels from one medium to another, some portion of the light is reflected from the interface between the two media. For example, typically about 4-5% of the light shining on a clear plastic substrate is reflected at the top surface.

[0002] Different approaches have been employed to reduce the reflection of polymeric materials. One approach is to use antireflective coatings such as multilayer reflective coatings consisting of transparent thin film structures with alternating layers of contrasting refractive index to reduce reflection. It is difficult, however, to achieve broadband antireflection using the multilayer antireflective coating technology.

[0003] Another approach involves using subwavelength surface structure (e.g., subwavelength scale surface gratings) for broadband antireflection. Methods for creating the subwavelength surface structure such as by lithography, tend to be relatively complicated and expensive. Additionally, it is challenging to obtain consistent low reflection broadband antireflection with minimized higher order diffraction from a roll-to-roll process with subwavelength scale surface gratings. A solution to provide high performance, low interference fringing, is desired, as is one also having relatively low reflection (i.e., average reflection over the visible range less than 0.5 percent), low birefringence (i.e., having an optical retardation value of less than 200 nm), and antireflective characteristics.

Summary

[0004] ~~In one aspect, t~~The present disclosure describes an article comprising a substrate having first major surface and second, generally opposed major surfaces, and a first layer on the first major surface, wherein the first layer has a first random, nanostructured surface, and wherein the first layer has an average thickness up to 0.5 micrometer (in some embodiments, up to 0.4 micrometer, 0.3 micrometer, 0.25 micrometer, 0.2 micrometer, 0.15 micrometer, 0.1 micrometer, or even up to 0.075 micrometer).

[0004a] In one aspect, there is provided an article comprising a substrate having first major surface and second, generally opposed major surfaces, and a first layer on the first major surface, wherein the first layer has a first random, anisotropic nanostructured surface, wherein the first layer comprises a matrix and a nanoscale dispersed phase, wherein the first, anisotropic random, nanostructured surface comprises nanofeatures having a height to width ratio of at least 5:1, wherein a majority of the nanofeatures are capped with nanoscale dispersed phase from the nanoscale phase in the matrix, wherein the first layer has an average thickness up to 0.5 micrometer, and wherein the first, random, nanostructured anisotropic surface of the first layer itself has a percent reflection of less than 1%.

[0005] In some embodiments, articles described herein exhibit an interference fringing appearance between the first layer and the first major surface of the substrate that is reduced by at least 50 (in some