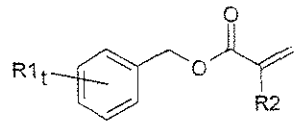
t is an integer from 1 to 4; and

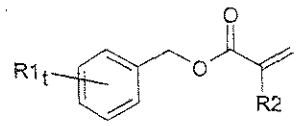
R2 is hydrogen or methyl.

In a first aspect, there is provided an optical film comprising a preformed polymeric film base layer and a polymerized microstructured optical layer, the polymerized microstructured optical layer comprising a linear array of regular right prisms, the prisms having peaks with a spacing of no greater than 300 microns wherein the polymerized microstructured optical layer comprises the reaction product of a polymerizable resin composition comprising nanoparticles; at least one first monomer comprising at least two (meth)acrylate groups; and at least one second (meth)acrylate monomer having the structure



wherein at least one R1 comprises an aromatic substituent, t is an integer from 1 to 4, and R2 is hydrogen or methyl.

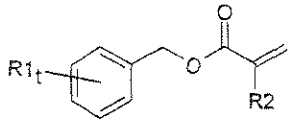
In a second aspect, there is provided an optical film comprising a polymerized surface that comprises the reaction product of a polymerizable resin composition comprising nanoparticles; at least one first monomer comprising at least two (meth)acrylate groups; and at least one second (meth)acrylate monomer having the structure



wherein at least one R1 comprises an aromatic substituent, t is an integer from 1 to 4, and R2 is hydrogen or methyl.

Also described are polymerizable resin compositions comprising benzyl (meth)acrylate monomers and nanoparticles.

In a third aspect, there is provided a polymerizable resin composition comprising nanoparticles; at least one first monomer comprising at least two (meth)acrylate groups; and at least one second (meth)acrylate monomer having the structure



wherein at least one R1 comprises an aromatic substituent, t is an integer from 1 to 4, and R2 is hydrogen or methyl.

DETAILED DESCRIPTION

Presently described are (e.g. microstructured) optical films prepared from polymerizable resin compositions.

The polymerized microstructure can be an optical element or optical product constructed of a base layer and a polymerized microstructured optical layer. The base layer and optical layer can be formed from the same or different polymeric material. One preferred optical film having a polymerized microstructured surface is a brightness enhancing film.

Brightness enhancing films generally enhance on-axis luminance (referred herein as "brightness") of a lighting device. Brightness enhancing films can be light transmissible, microstructured films. The microstructured topography can be a plurality of prisms on the film surface such that the films can be used to redirect light through reflection and refraction. The height of the prisms typically ranges from about 1 to about 75 microns. When used in an optical display such as that found in laptop computers, watches, etc., the microstructured optical film can increase brightness of an optical display by limiting light escaping from the display to within a pair of planes disposed at desired angles from a normal axis running through the optical display. As a result, light that would exit the display outside of the allowable range is reflected back into the display where a portion of it can be "recycled" and returned back to the microstructured film at an angle that allows it to escape from the display. The recycling is useful because it can reduce power consumption needed to provide a display with a desired level of brightness.

The brightness enhancing film of the invention generally comprises a (e.g. preformed polymeric film) base layer and an optical layer. The optical layer comprises a linear array of regular right prisms. Each prism has a first facet and a second facet. The prisms are formed on base that has a first surface on which the prisms are formed and a second surface that is substantially flat or planar and opposite first surface. By right prisms it is meant that the apex angle is typically about 90°. However, this angle can range from 70° to 120° and may range from 80° to 100°. These apexes can be sharp, rounded or flattened or truncated. For example, the ridges can be rounded to a radius in a range of 4 to 7 to 15 micrometers. The spacing between prism peaks (or pitch) can be 5 to 300 microns. For thin brightness enhancing films, the pitch is preferably 10 to 36 microns, and more preferably 18 to 24 microns. This corresponds to prism heights of preferably about 5 to 18 microns, and more preferably about 9 to 12 microns. The prism facets need not be identical, and the prisms may be tilted with respect to each other. The relationship between the total thickness of the optical article, and the height of the prisms, may vary. However, it is typically desirable to use relatively thinner optical layers with well-defined prism facets. For thin brightness enhancing films on substrates with thicknesses close to 1 mil (20-35 microns), a typical ratio of prism height to total thickness is generally between 0.2 and 0.4.