important and device manufacturers choose low thickness to reduce material costs. A typical thickness of photo-alignment layers in the state of the art is around 100 nm or less. This is in particular the case for application as alignment layers in LCDs, where thicker layers have the disadvantage that they lead to an increase of the effective threshold voltage for switching the LCD.

[0004] As long as the substrates are flat or slightly curved there are different standard coating techniques which can be used to homogeneously apply the photo-alignment layer. However, if a photo-alignment layer has to be applied to a substrate comprising smaller structures, for example microstructures, such as micro lenses or micro-prisms, or structures exhibiting abrupt changes of the shape, such as rectangular structures, coating of a thin homogeneous layer is more complex and depending on the specific application, may even be impossible.

[0005] A further drawback of the state of the art photo-alignment technique is that the substrates which are used as a support for materials which need to be aligned, such as liquid crystals, have first to be coated with a thin photo-alignment layer, which increases costs and manufacturing time and reduces the production yield.

SUMMARY ~~OF THE INVENTION~~

[0006] The goal of the present ~~invention~~ disclosure is to provide a solution, which overcomes above mentioned drawbacks of the state of the art photo-alignment technique.

[0007] The ~~invention~~ present disclosure includes a method for manufacturing a photo-alignable object. The ~~invention~~ present disclosure further provides compositions for the manufacturing of a photo-alignable object. The ~~invention~~ present disclosure also provides different embodiments of photo-alignable objects as well as devices incorporating such objects.

[0008] In the method according to the ~~invention~~ present disclosure an object is manufactured from a material composition, which comprises a photo-alignable material. The method of the ~~invention~~ present disclosure differs from that of the state of the art photo-alignment technique that the object itself is photo-alignable and an additional deposition of a thin photo-alignment layer is not required. This has the advantage that the number of coating steps is reduced, which increases yield in production.

[0009] Accordingly, a method of the ~~invention~~ present disclosure for preparation of a photo-alignable object comprises the steps of

- providing a material composition comprising a photo-alignable material

- generation of an object from the material composition.

[0010] The material composition may consist of the photo-alignable material alone or it may comprise additional substances. Preferably, the material composition comprises at least one photo-alignable material and at least one additional substance, wherein the materials are so selected that in an object prepared from the composition phase separation can occur, such that the concentration of at least one sort of photo-alignable material is higher at least at one surface of the object than in the bulk of the object.

[0011] An object in the meaning of this application can have any form or shape. For example, it may be a body with complex surfaces. In a preferred embodiment, the object is a flexible foil. In another preferred embodiment, the object comprises topographical surface structures, such as microstructures like micro lenses or micro-prisms, or structures exhibiting abrupt changes of the shape, such as rectangular structures.

[0012] The object may be generated by any suitable method like, extruding, casting, molding, 2D- or 3D-printing or coating.

[0012a] In one aspect of the present disclosure, there is provided a method for the production of a photo-alignable object comprising the steps
- providing a material composition comprising a photo-alignable material
- generation of an object from the material composition.

[0012b] In another aspect of the present disclosure, there is provided a photo-alignable object manufactured according to the method as described herein.

[0012c] In yet another aspect of the present disclosure, there is provided a photo-alignable object, which has a thickness of more than 2µm.

[0012d] In a further aspect of the present disclosure, there is provided a photo-aligned object, manufactured by exposing an object as described herein to aligning light.

[0012e] In another aspect of the present disclosure, there is provided a device containing a slave material, which has been aligned by a photo-aligned object as described herein.

[0012f] In yet another aspect of the present disclosure, there is provided an autostereoscopic 3D display comprising a device as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The invention is further illustrated by the accompanying drawing figures. It is emphasized that the various features are not necessarily drawn to scale.

[0014] Fig. 1 depicts an example of the state of the art photo-alignment technique, where a thin photo-alignment layer is applied to a support.

[0015] Fig. 2 shows an application, in which a photo-alignable object with a surface structure has been used to align a slave material on top.

[0016] Fig. 3 shows a cell, wherein a liquid crystal is aligned by two photo-aligned objects.

[0017] Fig. 4 illustrates an example of generating a photo-alignable object with surface structures.

[0018] Fig. 5 illustrates a method of generating a photo-alignable object with surface structures by imprinting.

CLAIMS

1. Method for the production of a photo-alignable object comprising the steps
- providing a material composition comprising a photo-alignable material
- generation of an object ~~(11, 22, 24, 35, 44, 45, 53)~~ from the material composition.

2. Method according to claim 1, wherein the material composition comprises a photo-alignable material and another substance, which does not comprise photo-alignable moieties.

3. Method according to claim 2, wherein the percentage by weight of the sum of the photo-alignable materials in the composition is less than 50%.

4. Method according to any of claims 2 or 3, wherein the photo-alignable material and the other substance are phase separated.

5. Method according to any of claims 1 to 4, wherein the photo-alignable material comprises fluorinated moieties.

6. Method according to any preceding claim, wherein the object ~~(53)~~ is generated on a support ~~(51)~~ and in a subsequent step the object is removed from the support.

7. Method according to any preceding claim, wherein the object ~~(53)~~ is generated on a support ~~(51)~~, which has a topographical surface structure.

8. Method according to any preceding claim, wherein the object ~~(53)~~ is generated on a moving support.

9. Method according to any preceding claim, wherein the material composition ~~(52)~~ comprising a photo-alignable material is casted to a mold ~~(50)~~ which provides a surface structure ~~(51)~~ and in a later step the object ~~(53)~~ generated from the composition comprising a photo-alignable material is removed from the mold.

10. Method according to any preceding claim, wherein surface structures ~~(46, 47)~~ are created in the photo-alignable object ~~(45)~~, either during or after preparation of the object ~~(45)~~, by embossing with an embossing tool ~~(40)~~.

11. Method according to any preceding claim, wherein the photo-alignable object is subsequently exposed to aligning light.

12. Method according to claim 11, wherein a slave material ~~(14, 23, 56)~~ is applied on at least part of the photo-aligned object ~~(11, 22, 24, 53)~~.

13. Method according to claim 12, wherein the slave material ~~(14, 23, 56)~~ is an LCP material.

14. Photo-alignable object ~~(11, 22, 24, 35, 44, 45, 53)~~ manufactured according to any of claims 1 to 10.

15. Photo-alignable object ~~(11, 22, 24, 35, 44, 45, 53)~~, which has a thickness of more than 2µm.

16. Photo-alignable object according to any of claims 14 or 15, which is in the form of a free standing film ~~(11, 53)~~.

17. Photo-alignable object ~~(11, 35, 45, 53)~~ according to any of claims 14 to 16, which has a topographical surface structure.

18. Photo-alignable object ~~(11, 35, 45, 53)~~ according to claim 17, wherein the depth of the topographical surface structure is larger than 100nm.

19. Photo-alignable object ~~(11, 35, 45, 53)~~ according to claim 17 or 18, wherein the surface structure comprises microelements.

20. Photo-aligned object ~~(11, 22, 24, 53)~~, manufactured by exposing an object according to any of claims 14 to 19 to aligning light.

21. Device ~~(10, 20, 58)~~ containing a slave material ~~(13, 23, 56)~~, which has been aligned by a photo-aligned object ~~(11, 22, 24, 53)~~ according to claim 20.

22. Device ~~(10, 58)~~ according to claim 21, wherein the slave material ~~(13, 56)~~ has at least one surface ~~(12, 54)~~ which is topographically structured and is or was in contact with the photo-aligned object ~~(11, 53)~~.

23. Device ~~(58)~~ according to claim 22, wherein the slave material has the function of anisotropic lenses.

24. Autostereoscopic 3D display comprising a device according to any of claims 21 to 23.