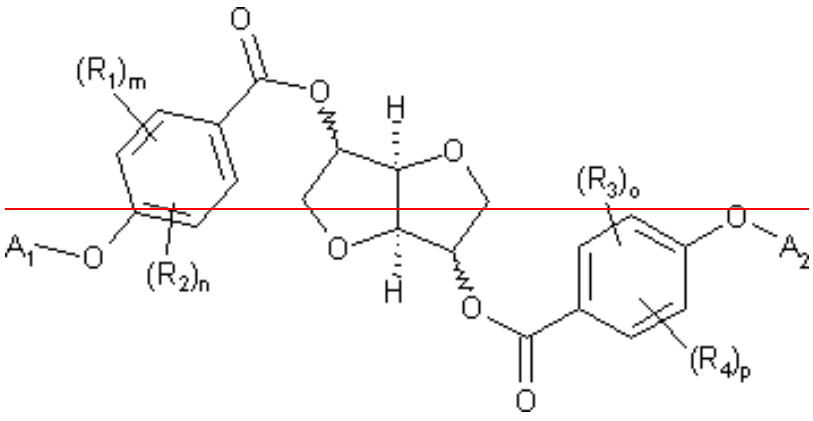
8.The substrate of any one of claims 1 to 7, wherein the chiral liquid crystal precursor composition comprises at least one chiral dopant compound B of formula (I):



(I)

wherein:

R_1, R_2, R_3, R_4, R_5, R_6, R_7 and R_8 each independently denote C_1-C_6 alkyl and C_1-C_6 alkoxy;

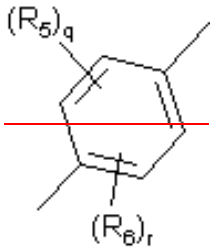
A_1 and A_2 each independently denote a group of formula (i) to (iii):

(i) $-[(CH_2)y\text{-}O]_z\text{-}C(O)\text{-}CH=CH_2$;

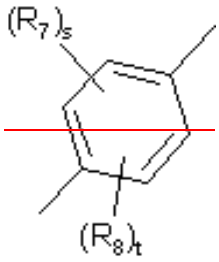
(ii) $-C(O)\text{-}D_1\text{-}O\text{-}[(CH_2)_y\text{-}O]_z\text{-}C(O)\text{-}CH=CH_2$;

(iii) $-C(O)\text{-}D_2\text{-}O\text{-}[(CH_2)_y\text{-}O]_z\text{-}C(O)\text{-}CH=CH_2$;

D_1 denotes a group of formula



D_2 denotes a group of formula



~~m, n, o, p, q, r, s, and t each independently denote 0, 1, or 2;~~

~~y denotes 0, 1, 2, 3, 4, 5, or 6;~~

~~z equals 0 if y equals 0 and z equals 1 if y equals 1 to 6.~~

~~9.~~8. The substrate of any one of claims 1 to ~~8~~7, wherein the at least one salt is selected from metal salts and ammonium salts.

~~10.~~9. The substrate of claim ~~9~~8, wherein the at least one salt comprises at least one of lithium perchlorate, lithium nitrate, lithium tetrafluoroborate, lithium bromide, lithium chloride, tetrabutylammonium perchlorate, tetrabutylammonium chloride, tetrabutylammonium tetrafluoroborate, tetrabutylammonium bromide, sodium carbonate, sodium chloride, and sodium nitrate.

~~11.~~10. The substrate of claim ~~9~~8, wherein the at least one salt comprises a metal salt.

~~12.~~11. The substrate of claim ~~11~~10, wherein the metal is selected from alkali and alkaline earth metals.

~~13.~~12. The substrate of claim ~~12~~11, wherein the metal is selected from Li and Na.

~~14.The substrate of claim 13, wherein the metal is Li.~~

~~15.~~13. The substrate of any one of claims 1 to ~~14~~12, wherein at least one of the one or more polymerizable monomers for providing the modifying resin comprises at least two unsaturated carbon-carbon bonds.

~~16.~~14. The substrate of any one of claims 1 to ~~15~~13, wherein at least one of the one or more polymerizable monomers for providing the modifying resin comprises at least one heteroatom selected from O, N and S.

~~17.The substrate of claim 16, wherein the at least heteroatom comprises O.~~

~~18.~~15. The substrate of any one of claims 1 to ~~17~~14, wherein at least one of the one or more polymerizable monomers for providing the modifying resin comprises at least one group of formula H_2C=CH-C(O)- or H_2C=C(CH_3)-C(O)-.

~~19.~~16. The substrate of any one of claims 1 to ~~18~~15, wherein at least one of the one or more polymerizable monomers for providing the modifying resin is selected from polyether acrylates, modified polyether acrylates, polyester acrylates, modified polyester acrylates, hexafunctional polyester acrylates, tetrafunctional polyester acrylates, aromatic difunctional urethane acrylates, aliphatic difunctional urethane acrylates, aliphatic trifunctional urethane acrylates, aliphatic hexafunctional urethane acrylates, urethane monoacrylates, aliphatic di-acrylates, bisphenol A epoxy acrylates, modified bisphenol A epoxy acrylates, epoxy acrylates, modified epoxy acrylates, acrylic oligomers, hydrocarbon acrylate oligomers, ethoxylated phenol acrylates, polyethylene glycol diacrylates, propoxylated neopentyl glycol diacrylates, diacrylated bisphenol A derivatives, dipropylene glycol diacrylates, hexanediol dicarylates, tripropylene glycol diacrylates, polyether tetraacrylates, ditrimethylol propane tetraacrylates, dipentaerythritol hexaacrylates, mixtures of pentaerythritol tri- and tetraacrylates, dipropylene glycol diacrylates, hexanediol diacrylates, ethoxylated trimethylol propane triacrylates, and tripropylene glycol diacrylates.

~~20.~~17. The substrate of any one of claims 1 to ~~19~~16, wherein the modifying resin comprises a radiation-cured resin.

~~21.~~18. The substrate of claim ~~20~~17, wherein the radiation-cured modifying resin comprises a UV-cured resin.

~~22.~~19. The substrate of any one of claim 1 to ~~14~~11, wherein the modifying resin comprises a dried aqueous resin.

~~23.~~20. The substrate of any one of claims 1 to ~~22~~19, wherein the modifying resin shifts a position of the selective reflection band exhibited by the cured chiral liquid crystal precursor composition comprising the at least one salt, by at least about 5 nm.

~~24.~~21. The substrate of any one of claims 1 to ~~23~~20, wherein the modifying resin shifts a position of the selective reflection band exhibited by the cured chiral liquid crystal precursor composition comprising the at least one salt, to shorter wavelengths.

~~25.~~22. The substrate of any one of claims 1 to ~~24~~21, wherein at least a part of the selective reflection band exhibited by the cured chiral liquid crystal precursor composition that has been shifted by the modifying resin is in the visible range.

~~26.~~23. The substrate of any one of claims 1 to ~~25~~22, wherein at least one of the one or more areas which carry the modifying resin is in a form of at least one of an image, a picture, a logo, indicia, and a pattern representing a code selected from one or more of a 1-dimensional barcode, a stacked 1-dimensional barcode, a 2-dimensional barcode, a 3-dimensional barcode, and a data matrix.

~~27.~~24. The substrate of any one of claims 1 to ~~26~~23, wherein at least a part of the cured chiral liquid crystal precursor composition is in a form of at least one of an image, a picture, a logo, indicia, and a pattern representing a code selected from one or more of a 1-dimensional barcode, a stacked 1-dimensional barcode, a 2-dimensional barcode, a 3-dimensional barcode, and a data matrix.

~~28.~~25. The substrate of any one of claims 1 to ~~27~~24, wherein the substrate is or comprises at least one of a label, packaging, a cartridge, a container or a capsule that contains foodstuffs, neutraceuticals, pharmaceuticals, or beverages, a banknote, a credit card, a stamp, a tax label, a security document, a passport, an identity card, a driver's license, an access card, a transportation ticket, an event ticket, a voucher, an ink-transfer film, a reflective film, an aluminum foil, and a commercial good.

~~29.~~26. A method of providing a marking on a substrate, wherein the method comprises:

a) applying onto a surface of a substrate which carries a modifying resin made from one or more polymerizable monomers in one or more areas of the surface of the substrate a curable chiral liquid crystal precursor composition in such a way that the composition covers at least a part of the one or more areas carrying the modifying resin and also covers at least one area of the surface that does not carry the modifying resin, the chiral liquid crystal precursor composition comprising at least one salt that changes a position of a selective reflection band exhibited by the cured composition compared to a position of a selective

reflection band exhibited by a cured composition that does not contain the at least one salt;

b) heating the applied composition to bring same to a chiral liquid crystal state; and

c) curing the composition in the chiral liquid crystal state;

and wherein the modifying resin shifts the position of the selective reflection band exhibited by the cured chiral liquid crystal precursor composition comprising the at least one salt, on the substrate in the one or more areas in which it is present.

~~30.~~27. The method of claim ~~29~~26, wherein b) comprises heating the composition to a temperature of from about 55°C to about 150°C.

~~31.~~28. The method of any one of claims ~~29~~26 and ~~30~~27, wherein the composition is applied by at least one of spray coating, knife coating, roller coating, screen coating, curtain coating, gravure printing, flexography, screen-printing, pad printing, continuous ink-jet printing, drop-on-demand ink-jet printing, and valve-jet printing.

~~32.~~29. The method of any one of claims ~~29~~26 to ~~31~~28, wherein the composition is applied in a form of at least one of an image, a picture, a logo, indicia, and a pattern representing a code selected from one or more of a 1-dimensional barcode, a stacked 1-dimensional barcode, a 2-dimensional barcode, a 3-dimensional barcode, and a data matrix.

~~33.~~30. The method of any one of claims ~~29~~26 to ~~32~~29, wherein the modifying resin is present in at least one of the one or more areas in a form of at least one of an image, a picture, a logo, indicia, and a pattern representing a code selected from one or more of a 1-dimensional barcode, a stacked 1-dimensional barcode, a 2-dimensional barcode, a 3-dimensional barcode, and a data matrix.

~~34.The method of any one of claims 29 to 33, wherein the modifying resin has been provided on the substrate by at least one of spray coating, knife coating, roller coating, screen coating, curtain coating, gravure printing, flexography, offset printing, dry offset~~

~~printing, letterpress printing, screen-printing, pad printing, continuous ink-jet printing, drop-on-demand ink-jet printing, and valve-jet printing.~~

~~35.~~31. The method of any one of claims ~~29~~26 to ~~34~~30, wherein the substrate is or comprises at least one of a label, packaging, a cartridge, a container or a capsule that contains foodstuffs, beverages, nutraceuticals or pharmaceuticals, a banknote, a credit card, a stamp, a tax label, a security document, a passport, an identity card, a driver's license, an access card, a transportation ticket, an event ticket, a voucher, an ink-transfer film, a reflective film, an aluminum foil, and a commercial good.

~~36.The method of any one of claims 29 to 35, wherein the modifying resin is capable of shifting the position of the selective reflection band exhibited by the cured composition comprising the at least one salt, on the substrate by at least about 5 nm.~~

~~37.~~32. The method of any one of claims ~~29~~26 to ~~36~~31, wherein the chiral liquid crystal precursor composition comprises (i) one or more nematic compounds A and (ii) one or more chiral dopant compounds B which are capable of giving rise to a cholesteric state of the chiral liquid crystal precursor composition.

~~38.~~33. The method of claim ~~37~~32, wherein the chiral liquid crystal precursor composition comprises at least two compounds A.

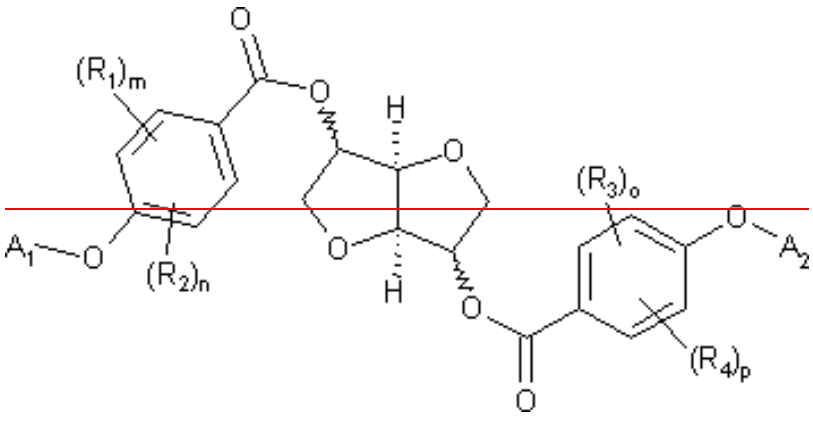
~~39.~~34. The method of any one of claims ~~37~~32 and ~~38~~33, wherein the one or more nematic compounds A as well as the one or more chiral dopant compounds B comprise at least one compound that comprises at least one polymerizable group.

~~40.~~35. The method of claim ~~39~~34, wherein the at least one polymerizable group comprises an unsaturated carbon-carbon bond.

~~41.~~36. The method of claim ~~40~~35, wherein the at least one polymerizable group comprises a group of formula H_2C=CH-C(O)-.

~~42.~~37. The method of any one of claims ~~37~~32 to ~~41~~36, wherein all of the one or more nematic compounds A and all of the one or more chiral dopant compounds B comprise at least one polymerizable group.

43.The method of any one of claims 29 to 42, wherein the chiral liquid crystal precursor composition comprises at least one chiral dopant compound B of formula (I):



(I)

wherein:

R_1, R_2, R_3, R_4, R_5, R_6, R_7 and R_8 each independently denote C_1-C_6 alkyl and C_1-C_6 alkoxy;

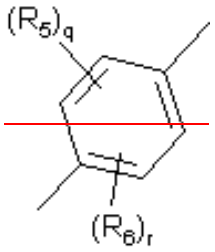
A_1 and A_2 each independently denote a group of formula (i) to (iii):

(i) $-[(CH_2)y\text{-}O]_z\text{-}C(O)\text{-}CH=CH_2$;

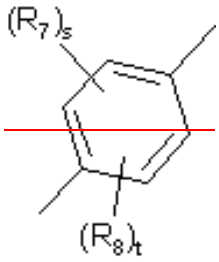
(ii) $-C(O)\text{-}D_1\text{-}O\text{-}[(CH_2)_y\text{-}O]_z\text{-}C(O)\text{-}CH=CH_2$;

(iii) $-C(O)\text{-}D_2\text{-}O\text{-}[(CH_2)_y\text{-}O]_z\text{-}C(O)\text{-}CH=CH_2$;

D_1 denotes a group of formula



D_2 denotes a group of formula



~~m, n, o, p, q, r, s, and t each independently denote 0, 1, or 2;~~

~~y denotes 0, 1, 2, 3, 4, 5, or 6;~~

~~z equals 0 if y equals 0 and z equals 1 if y equals 1 to 6.~~

~~44.~~38. The method of any one of claims ~~29~~26 to ~~43~~37, wherein the at least one salt is selected from metal salts and ammonium salts.

~~45.~~39. The method of claim ~~44~~38, wherein the at least one salt comprises at least one of lithium perchlorate, lithium nitrate, lithium tetrafluoroborate, lithium bromide, lithium chloride, tetrabutylammonium perchlorate, tetrabutylammonium chloride, tetrabutylammonium tetrafluoroborate, tetrabutylammonium bromide, sodium carbonate, sodium chloride, and sodium nitrate.

~~46.~~40. The method of claim ~~44~~38, wherein the at least one salt comprises a metal salt.

~~47.~~41. The method of claim ~~46~~40, wherein the metal is selected from alkali and alkaline earth metals.

~~48.~~42. The method of claim ~~47~~41, wherein the metal is selected from Li and Na.

~~49.The method of claim 48, wherein the metal comprises Li.~~

~~50.~~43. The method of any one of claims ~~29~~26 to ~~49~~42, wherein the modifying resin is made from one or more polymerizable monomers.

~~51.~~44. The method of claim ~~50~~43, wherein at least one of the one or more polymerizable monomers comprises at least two unsaturated carbon-carbon bonds.

~~52.~~45. The method of any one of claims ~~50~~43 and ~~51~~44, wherein at least one of the one or more polymerizable monomers comprises at least one heteroatom selected from O, N and S.

~~53.The method of claim 52, wherein the at least heteroatom comprises O.~~

~~54.~~46. The method of any one of claims ~~50~~43 to ~~53~~45, wherein at least one of the one or more polymerizable monomers comprises at least one group of formula H_2C=CH-C(O)- or H_2C=C(CH_3)-C(O)-.

~~55.~~47. The method of any one of claims ~~50~~43 to ~~54~~46, wherein at least one of the one or more polymerizable monomers is selected from polyether acrylates, modified polyether acrylates, polyester acrylates, modified polyester acrylates, hexafunctional polyester acrylates, tetrafunctional polyester acrylates, aromatic difunctional urethane acrylates, aliphatic difunctional urethane acrylates, aliphatic trifunctional urethane acrylates, aliphatic hexafunctional urethane acrylates, urethane monoacrylates, aliphatic di-acrylates, bisphenol A epoxy acrylates, modified bisphenol A epoxy acrylates, epoxy acrylates, modified epoxy acrylates, acrylic oligomers, hydrocarbon acrylate oligomers, ethoxylated phenol acrylates, polyethylene glycol diacrylates, propoxylated neopentyl glycol diacrylates, diacrylated bisphenol A derivatives, dipropylene glycol diacrylates, hexanediol dicarylates, tripropylene glycol diacrylates, polyether tetraacrylates, ditrimethylol propane tetraacrylates, dipentaerythritol hexaacrylates, mixtures of pentaerythritol tri- and tetraacrylates, dipropylene glycol diacrylates, hexanediol diacrylates, ethoxylated trimethylol propane triacrylates, and tripropylene glycol diacrylates.

~~56.~~48. The method of any one of claims ~~29~~26 to ~~55~~47, wherein the modifying resin comprises a radiation-cured resin.

~~57.~~49. The method of claim ~~56~~48, wherein the radiation-cured modifying resin comprises a UV-cured resin.

~~58.~~50. The method of any one of claims ~~29~~26 to ~~55~~47, wherein the modifying resin comprises a dried aqueous resin.

~~59.A substrate provided with a marking, wherein the substrate is obtainable by the method of any one of claims 29 to 58.~~

~~60.A method of changing a position of a selective reflection band exhibited by a cured chiral liquid crystal precursor composition comprising (i) one or more nematic~~

~~compounds, (ii) one or more chiral dopant compounds which are capable of giving rise to a cholesteric state of the cured composition, and (iii) at least one salt that changes a position of a selective reflection band exhibited by the cured composition compared to a position of a selective reflection band exhibited by a cured composition that does not contain the at least one salt, wherein the method comprises contacting the composition with a modifying resin which is made from one or more polymerizable monomers, at least one of the monomers comprising a heteroatom selected from O, N, and S, and is capable of changing a position of a selective reflection band exhibited by the cured chiral liquid crystal precursor composition comprising the at least one salt.~~

~~61.The method of claim 60, wherein a position of the selective reflection band is shifted by the modifying resin by at least about 5 nm.~~