CLAIMS

1. A method for manufacturing a homeotropically-aligned liquid crystal film, the method comprising:

an application step of applying a liquid crystalline composition onto a film substrate, the film substrate has a first main surface and a second main surface and no vertical alignment film is provided, the liquid crystalline composition contains a side chain-type liquid crystal polymer and a photopolymerizable liquid crystal monomer,

a liquid crystal aligning step of homeotropically aligning the liquid crystal polymer and the liquid crystal monomer in a liquid crystal state; and

a photopolymerization step of polymerizing or crosslinking the liquid crystal monomer by photoirradiation,

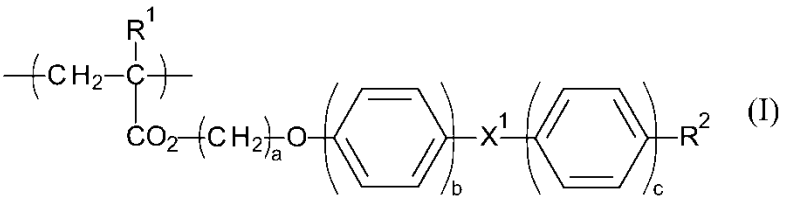
wherein

the side chain-type liquid crystal polymer has a monomer unit containing a liquid crystalline fragment side chain and a monomer unit containing a non-liquid crystalline fragment side chain,

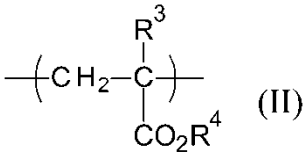
the film substrate is a stretched film having an in-plane retardation of 10 to 500 nm, and

a heating temperature T (°C) in the liquid crystal aligning step and an in-plane birefringence Δn of the film substrate satisfy $T \leq 100\text{-}3.5\times10^{3}\Delta n$.

2. The method for manufacturing a homeotropically-aligned liquid crystal film according to claim 1, wherein the side chain-type liquid crystal polymer contains a liquid crystalline monomer unit represented by the following general formula (I) and a non-liquid crystalline monomer unit represented by the following general formula (II):



(I)



(II)

wherein

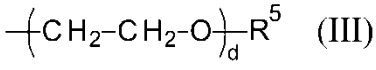
R^1 and R^3 are each independently a hydrogen atom or a methyl group,

X^1 is $-CO_2-$ or $-OCO-$,

R^2 is a cyano group, a fluoro group, an alkyl group having 1 to 6 carbon atoms, or an alkoxy group having 1 to 6 carbon atoms,

"a" is an integer of 1 to 6, and "b" and "c" are each independently 1 or 2, and

R^4 is an alkyl group having 7 to 22 carbon atoms, a fluoroalkyl group having 1 to 22 carbon atoms, or a group represented by the following general formula (III),



(III)

wherein R^5 is an alkyl group having 1 to 5 carbon atoms, and d is an integer of 1 to 6.

3. The method for manufacturing a homeotropically-aligned liquid crystal film according to claim 1 or 2, wherein an arithmetic mean roughness of the first main surface of the film substrate is 3 nm or less.

4. The method for manufacturing a homeotropically-aligned liquid crystal film according to any one of claims 1 to 3, wherein an easily-sliding layer is disposed on a second main surface of the film substrate, and easily-sliding layer is not disposed on the first main surface of the film substrate.

5. The method for manufacturing a homeotropically-aligned liquid crystal film according to any one of claims 1 to 4, wherein the film substrate is a norbornene-based polymer film.

6. The method for manufacturing a homeotropically-aligned liquid crystal film according to any one of claims 1 to 5, wherein a content of the photopolymerizable liquid crystal monomer is 1.1 to 10 times a content of the side chain-type liquid crystal polymer in the liquid crystalline composition.

7. The method for manufacturing a homeotropically-aligned liquid crystal film according to any one of claims 1 to 6, wherein the film substrate is a biaxially-stretched film.

8. The method for manufacturing a homeotropically-aligned liquid crystal film according to any one of claims 1 to 7, wherein the heating temperature T in the liquid crystal aligning step is 75°C or less.