CLAIMS

1. A patterning method for forming a pattern by irradiating light toward a photocurable patterning material, the method comprising the steps of:

(i) supplying a release material in a liquid state having a first specific gravity d_1 and the patterning material in a liquid state that has a second specific gravity d_2 smaller than the first specific gravity d_1 and phase-separates from the release material to a patterning tray including a bottom portion having a light-exposed surface on an outer bottom surface of the bottom portion, to form a first liquid layer of the release material in contact with the bottom portion and also form, on the first liquid layer, a second liquid layer of the patterning material in contact with the first liquid layer, and thereby forming a liquid film made of the patterning material in a vicinity of an interface of the second liquid layer with the first liquid layer; and

(ii) irradiating light to the liquid film via the bottom portion and the first liquid layer from a light source disposed to oppose the light-exposed surface below the patterning tray, to photocure the liquid film and form a pattern.

2. The patterning method in accordance with claim 1,

wherein the first specific gravity d_1 is 1.2 or more, and

a difference between the first specific gravity d_1 and the second specific gravity d_2 is 0.1 or more.

3. The patterning method in accordance with claim 1 or 2,

wherein a difference between a surface tension of the patterning material and a surface tension of the release material is 10 mN/m or more.

4. The patterning method in accordance with any one of claims 1 to 3,

wherein the release material is a liquid that is inert to the patterning material and the light, and the liquid is a fluorine-containing liquid or a solution containing a salt.

5. The patterning method in accordance with any one of claims 1 to 4,

wherein the release material when forming the pattern in the step (ii) has a viscosity of 10 Pa·s or less.

6. The patterning method in accordance in accordance with any one of claims 1 to 5,

wherein, in the step (i), the liquid film is formed between a pattern forming surface of a platform and the first liquid layer by immersing the pattern forming surface in the second liquid layer.

7. The patterning method in accordance with claim 6, further comprising the steps of:

after the step (ii),

(iii) forming an additional liquid film made of the patterning material between the pattern and the first liquid layer by lifting the pattern forming surface; and

(iv) irradiating light to the additional liquid film via the first liquid layer to photocure the additional liquid film and laminate an additional pattern on the pattern.

8. The patterning method in accordance with claim 7,

wherein the step (iii) and the step (iv) are repeated a plurality of times.

9. A patterning apparatus for forming a pattern by irradiating light toward a photocurable patterning material, the apparatus comprising:

a patterning tray that includes a bottom portion having a light-exposed surface on an outer bottom surface of the bottom portion and in which a release material in a liquid state having a first specific gravity d_1 and the patterning material in a liquid state that has a second specific gravity d_2 smaller than the first specific gravity d_1 and phase-separates from the release material are supplied to form a first liquid layer of the release material in contact with the bottom portion and also form, on the first liquid layer, a second liquid layer of the patterning material in contact with the first liquid layer so that a liquid film made of the patterning material is formed in a vicinity of an interface of the second liquid layer with the first liquid layer; and

a light source for emitting light to the liquid film via the bottom portion and the first liquid layer to photocure the liquid film and form a pattern, the light source disposed to oppose the light-exposed surface below the patterning tray.

10. The patterning apparatus in accordance with claim 9, further comprising:

a platform that includes a pattern forming surface and is movable in up and down directions to immerse the pattern forming surface in the second liquid layer and form the liquid film between the pattern forming surface and the first liquid layer.