WHAT IS CLAIMED IS:

1. An apparatus for curing a material by irradiating the material with light in a state in which a mold is brought into contact with the material, photochemical reaction velocity of the material being proportional to square root of an illuminance of the light with which the material is irradiated, the apparatus comprising:

an irradiator configured to irradiate the material with light for curing the material; and

a controller configured to control the irradiator,

wherein the controller determines an irradiation time during which the material is irradiated with the light from the irradiator based on the square root of the illuminance of the light from the irradiator, with which the material is irradiated.

2. An apparatus for curing a radical polymerizable material by irradiating the material with light in a state in which a mold is brought into contact with the material, comprising:

an irradiator configured to irradiate the material with light for curing the material; and

a controller configured to control the irradiator,

wherein the controller determines an irradiation time during which the material is irradiated with the light from the irradiator based on a square root of an illuminance of the light from the irradiator, with which the material is irradiated.

3. The apparatus according to claim 1, wherein the controller determines the irradiation time such that the irradiation time is inverse proportional to the square root of the illuminance of the light from the irradiator, with which the material is irradiated.

4. The apparatus according to claim 1, wherein letting $I_c$

be the illuminance of the light from the irradiator, with which the material is irradiated, $t_c$ be the irradiation time during which the material is irradiated with the light, k be a coefficient, and PD be a target degree of photopolymerization of the material subjected to irradiation with the light, the controller determines the irradiation time in accordance with:

$$PD = k \times (\sqrt{I_c}) \times t_c$$

5. The apparatus according to claim 4, further comprising an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein letting $I_c$ be the illuminance detected by the illuminance detector, the controller determines the irradiation time in accordance with:

$$PD = k \times (\sqrt{I_c}) \times t_c$$

6. The apparatus according to claim 1, further comprising:

a driving mechanism configured to change a relative distance between the material and the mold;

a separation force detector configured to detect a separation force required to separate the mold from the material; and

an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the irradiator irradiates the material with the light such that the material is cured, in a state in which the relative distance is set by the driving mechanism so as to bring the mold into contact with the material supplied on the substrate, and then the relative distance is changed by the driving mechanism so as to separate the mold from the material, and

wherein the controller causes the illuminance detector

to detect the illuminance if the separation force falls outside an allowable range, and determines the irradiation time based on the square root of the detected illuminance.

7. The apparatus according to claim 1, further comprising:

a driving mechanism configured to change a relative distance between the material and a mold;

a separation force detector configured to detect a separation force required to separate the mold from the material; and

an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the irradiator irradiates the material with the light such that the material is cured, in a state in which the relative distance is set by the driving mechanism so as to bring the mold into contact with the material supplied on the substrate, and then the relative distance is changed by the driving mechanism so as to separate the mold from the material, and

wherein the controller causes the illuminance detector to detect the illuminance if a product of the separation force and a time during which the separation force acts on the mold falls outside an allowable range, and determines the irradiation time based on the square root of the detected illuminance.

8. The apparatus according to claim 1, further comprising:

an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the controller causes the illuminance detector to detect the illuminance if a defect density of a pattern

obtained by curing the material falls outside an allowable range, and determines the irradiation time based on the square root of the detected illuminance.

9. The apparatus according to claim 1, wherein the controller determines an irradiation time during which the material is irradiated with the light from the irradiator based on the square root of the illuminance of the light from the irradiator, with which the material is irradiated in case that the material is not cured such that a degree of polymerization of the material falls within a predetermined range of a target degree of the polymerization of the material.

10. The apparatus according to claim 1, wherein the controller determines that whether or not the material is cured such that a degree of polymerization of the material falls within a predetermined range of a target degree of the polymerization of the material, and

the controller determines the irradiation time during which the material is irradiated with the light from the irradiator based on the square root of the illuminance of the light from the irradiator, with which the material is irradiated and a target value associated with polymerization of the material in case that the controller determines that the material is not cured such that the degree of the polymerization of the imprint material falls outside the predetermined range.

11. The apparatus according to claim 1, wherein the controller determines the irradiation time during which the material is irradiated with the light from the irradiator by dividing a target value associated with polymerization of the material by the square root of the illuminance of the light from the irradiator.

12. The apparatus according to claim 1, further comprising

an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the controller determines a first irradiation time during which the material is irradiated with the light from the irradiator, based on a square root of a first illuminance of the light from the irradiator, with which the material is irradiated, and controls the irradiator so that an irradiation time during which the material is irradiated with the light from the irradiator becomes the first irradiation time, and

wherein the illuminance detector detects a second illuminance of the light with which the irradiator irradiates the material, the second illuminance being different from the first illuminance, and

wherein the controller determines a second irradiation time during which the material is irradiated with the light from the irradiator, based on a square root of the detected second illuminance of the light from the irradiator, with which the material is irradiated, and controls the irradiator so that an irradiation time during which the material is irradiated with the light from the irradiator becomes the second irradiation time.

13. The apparatus according to claim 1, wherein the material is an imprint material for forming a pattern.

14. The apparatus according to claim 2, wherein the controller determines the irradiation time such that the irradiation time is inverse proportional to the square root of the illuminance of the light from the irradiator, with which the material is irradiated.

15. The apparatus according to claim 2, wherein letting $I_c$ be the illuminance of the light from the irradiator, with which the material is irradiated, $t_c$ be the irradiation time during

which the material is irradiated with the light, k be a coefficient, and PD be a target degree of photopolymerization of the material subjected to irradiation with the light, the controller determines the irradiation time in accordance with:

$$PD = k \times (\sqrt{I_c}) \times t_c$$

16. The apparatus according to claim 15, further comprising an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein letting $I_c$ be the illuminance detected by the illuminance detector, the controller determines the irradiation time in accordance with:

$$PD = k \times (\sqrt{I_c}) \times t_c$$

17. The apparatus according to claim 2, further comprising:

a driving mechanism configured to change a relative distance between the material and the mold;

a separation force detector configured to detect a separation force required to separate the mold from the material; and

an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the irradiator irradiates the material with the light such that the material is cured, in a state in which the relative distance is set by the driving mechanism so as to bring the mold into contact with the material supplied on the substrate, and then the relative distance is changed by the driving mechanism so as to separate the mold from the material, and

wherein the controller causes the illuminance detector to detect the illuminance if the separation force falls outside an allowable range, and determines the irradiation time based

on the square root of the detected illuminance.

18. The apparatus according to claim 2, further comprising:

a driving mechanism configured to change a relative distance between the material and a mold;

a separation force detector configured to detect a separation force required to separate the mold from the material; and

an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the irradiator irradiates the material with the light such that the material is cured, in a state in which the relative distance is set by the driving mechanism so as to bring the mold into contact with the material supplied on the substrate, and then the relative distance is changed by the driving mechanism so as to separate the mold from the material, and

wherein the controller causes the illuminance detector to detect the illuminance if a product of the separation force and a time during which the separation force acts on the mold falls outside an allowable range, and determines the irradiation time based on the square root of the detected illuminance.

19. The apparatus according to claim 2, further comprising:

an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the controller causes the illuminance detector to detect the illuminance if a defect density of a pattern obtained by curing the material falls outside an allowable range, and determines the irradiation time based on the square root

of the detected illuminance.

20. The apparatus according to claim 2, wherein the controller determines an irradiation time during which the material is irradiated with the light from the irradiator based on the square root of the illuminance of the light from the irradiator, with which the material is irradiated in case that the material is not cured such that a degree of polymerization of the material falls within a predetermined range of a target degree of the polymerization of the material.

21. The apparatus according to claim 2, wherein the controller determines that whether or not the material is cured such that a degree of polymerization of the material falls within a predetermined range of a target degree of the polymerization of the material, and

the controller determines the irradiation time during which the material is irradiated with the light from the irradiator based on the square root of the illuminance of the light from the irradiator, with which the material is irradiated and a target value associated with polymerization of the material in case that the controller determines that the material is not cured such that the degree of the polymerization of the imprint material falls outside the predetermined range.

22. The apparatus according to claim 2, wherein the controller determines the irradiation time during which the material is irradiated with the light from the irradiator by dividing a target value associated with polymerization of the material by the square root of the illuminance of the light from the irradiator.

23. The apparatus according to claim 2, further comprising an illuminance detector configured to detect the illuminance of the light with which the irradiator irradiates the material,

wherein the controller determines a first irradiation time during which the material is irradiated with the light from the irradiator, based on a square root of a first illuminance of the light from the irradiator, with which the material is irradiated, and controls the irradiator so that an irradiation time during which the material is irradiated with the light from the irradiator becomes the first irradiation time, and

wherein the illuminance detector detects a second illuminance of the light with which the irradiator irradiates the material, the second illuminance being different from the first illuminance, and

wherein the controller determines a second irradiation time during which the material is irradiated with the light from the irradiator, based on a square root of the detected second illuminance of the light from the irradiator, with which the material is irradiated, and controls the irradiator so that an irradiation time during which the material is irradiated with the light from the irradiator becomes the second irradiation time.

24. The apparatus according to claim 2, wherein the material is an imprint material for forming a pattern.

25. An apparatus for curing a material by irradiating the material with light in a state in which a mold is brought into contact with the material, photochemical reaction velocity of the material being proportional to square root of an illuminance of the light with which the material is irradiated, the apparatus comprising:

an irradiator configured to irradiate the material with light for curing the material,

wherein the irradiator cures the material by irradiating the material with the light during an irradiation time

determined based on the square root of the illuminance of the light from the irradiator, with which the imprint material is irradiated.

26. An apparatus for curing a radical polymerizable material by irradiating the material with light in a state in which a mold is brought into contact with the material, comprising:

an irradiator configured to irradiate the material with light for curing the material,

wherein the irradiator cures the material by irradiating the material with the light during an irradiation time determined based on the square root of the illuminance of the light from the irradiator, with which the imprint material is irradiated.

27. An apparatus for curing a material by irradiating the material with light in a state in which a mold is brought into contact with the material, photochemical reaction velocity of the material being proportional to square root of an illuminance of the light with which the material is irradiated, the apparatus comprising:

an irradiator configured to irradiate the material with light,

the irradiator including an adjustor configured to adjust an illuminance of the light with which the material is irradiated,

wherein the illuminance of the light is adjusted using the adjustor based on a square of an irradiation time during which the material is irradiated with the light from the irradiator.

28. An apparatus for curing a radical polymerizable material by irradiating the material with light in a state in which a mold is brought into contact with the material, the apparatus

comprising:

an irradiator configured to irradiate the material with light,

the irradiator including an adjustor configured to adjust an illuminance of the light with which the material is irradiated,

wherein the illuminance of the light is adjusted using the adjustor based on a square of an irradiation time during which the material is irradiated with the light from the irradiator.

29. The apparatus according to claim 27, wherein the controller determines that whether or not the material is cured such that a degree of polymerization of the material falls within a predetermined range of a target degree of the polymerization of the material, and

wherein the illuminance of the light is adjusted using the adjustor in case that the controller determines the material is not cured such that the degree of the polymerization of the material falls outside the predetermined range.

30. The apparatus according to claim 28, wherein the controller determines that whether or not the material is cured such that a degree of polymerization of the material falls within a predetermined range of a target degree of the polymerization of the material, and

wherein the illuminance of the light is adjusted using the adjustor in case that the controller determines the material is not cured such that the degree of the polymerization of the material falls outside the predetermined range.

31. An apparatus for curing an material by irradiating the material with light in a state in which a mold is brought into contact with the material, photochemical reaction velocity of

the material being proportional to square root of an illuminance of the light with which the material is irradiated, the apparatus comprising:

an irradiator configured to irradiate the material with light,

wherein the irradiator cures the material by irradiating the material with the light such that the light has an illuminance determined based on a square of an irradiation time during which the material is irradiated with the light from the irradiator.

32. An apparatus for curing a radical polymerizable material by irradiating the material with light in a state in which a mold is brought into contact with the material, the apparatus comprising:

an irradiator configured to irradiate the material with light,

wherein the irradiator cures the material by irradiating the material with the light such that the light has an illuminance determined based on a square of an irradiation time during which the material is irradiated with the light from the irradiator.

33. An article manufacturing method comprising:

curing a material on a substrate by irradiating the material with light in a state in which a mold is brought into contact with the material by using an apparatus according to any one of claims 1 to 32; and

processing the substrate on which the cured material is formed.