What is claimed is:

1. A substrate drying device comprising:

a substrate holding unit configured to hold a substrate;

a gas generator configured to generate a drying gas including at least IPA vapor, the drying gas is for drying the substrate; and

a drying gas nozzle configured to supply the drying gas to a surface of the substrate, wherein

the gas generator further comprising a filter for filtering the drying gas; and wherein

the filter has a filter size F that is set to enable the followings:

(1) a defect size D allowed in a defect test after the drying of the substrate is set to 20 nm or less, and

(2) 4 or more of a ratio of the defect size D over the filter size F.

2. The substrate drying device according to claim 1 comprising:

a substrate rotating unit configured to rotate the substrate holding unit;

a rinse liquid supply mechanism including a rinse liquid nozzle for supplying rinse liquid to a surface of the substrate;

a drying gas supply mechanism including the drying gas nozzle;

a nozzle moving mechanism for moving, according to drying treatment for the substrate, a supply position of the drying gas from the drying gas nozzle and a supply position of the rinse liquid from the rinse liquid nozzle; and

a control device configured to control operations of the substrate rotating unit, the nozzle moving mechanism, the rinse liquid supply mechanism, the gas generator, and the drying gas supply mechanism, wherein

when the surface of the substrate is concentrically divided into a center area where a rotation center of the substrate is present, an inner peripheral area present on an outer side of the center area, an outer peripheral area present on an outer side of the inner peripheral area, and a peripheral edge area located on an outermost periphery of the substrate, for the substrate drying device, while rotating the substrate with the substrate rotating unit, the control device:

(1) controls the rinse liquid supply mechanism to supply the rinse liquid from the rinse liquid nozzle to the surface of the substrate when the rinse liquid nozzle is located in the center area where the rotation center of the substrate is present, the inner peripheral area, or the outer peripheral area and stop supplying the rinse liquid from the rinse liquid nozzle to the surface of the substrate when the rinse liquid nozzle is located in the peripheral edge area;

(2) controls the gas generator to set concentration of a drying component included in the drying gas supplied from the drying gas nozzle to the surface of the substrate higher when the drying gas nozzle is located in the inner peripheral area or the outer peripheral area compared with when the drying gas nozzle is located in the center area and set the concentration of the drying component included in the drying gas supplied from the drying gas nozzle to the surface of the substrate to zero when the drying gas nozzle is located in the peripheral edge area; and

(3) controls the drying gas supply mechanism to supply the drying gas from the drying gas nozzle to the surface of the substrate when the drying gas nozzle is located in the center area, the inner peripheral area, or the outer peripheral area and reduce a flow rate of the drying gas supplied from the drying gas nozzle to the surface of the substrate when the drying gas nozzle is located in the peripheral edge area.

3. The substrate drying device according to claim 1 comprising:

a substrate rotating unit configured to rotate the substrate;

a rinse liquid nozzle configured to supply rinse liquid for covering the substrate with a liquid film to a surface of the substrate;

a nozzle moving mechanism for moving a supply position of the drying gas from the drying gas nozzle and a supply position of the rinse liquid from the rinse liquid nozzle; and

a control device configured to control a supply amount of the rinse liquid supplied from the rinse liquid nozzle to the surface of the substrate, concentration of a drying component included in the drying gas supplied from the drying gas nozzle to the surface of the substrate, and a flow rate of the drying gas supplied from the drying gas nozzle to the surface of the substrate, wherein

the substrate includes a center area where a rotation center of the substrate is present, an inner peripheral area present on an outer side of the center area, an outer peripheral area present on an outer side of the inner peripheral area, and a peripheral edge area present on an outer side of the outer peripheral area,

the control device performs control to supply the rinse liquid from the rinse liquid nozzle to the surface of the substrate when the rinse liquid nozzle is located in the center area, the inner peripheral area, or the outer peripheral area and stop supplying the rinse liquid from the rinse liquid nozzle to the surface of the substrate when the rinse liquid nozzle is located in the peripheral edge area,

the control device further performs control to set the concentration of the drying component included in the drying gas supplied from the drying gas nozzle to the surface of the substrate higher when the drying gas nozzle is located in the inner peripheral area or the outer peripheral area compared with when the drying gas nozzle is located in the center area and set the concentration of the drying component included in the drying gas supplied from the drying gas nozzle to the surface of the substrate to zero when the drying gas nozzle is located in the peripheral edge area, and

the control device further performs control to supply the drying gas from the drying gas nozzle to the surface of the substrate when the drying gas nozzle is located in the center area, the inner peripheral area, or the outer peripheral area and not to change the flow rate of the drying gas supplied from the drying gas nozzle to the surface of the substrate when the drying gas nozzle is located in the peripheral edge area.

4. The substrate drying device according to claim 2 or 3, further comprising a rotating-speed control unit configured to control rotating speed of the substrate by the substrate rotating unit, wherein

when the supply of the rinse liquid is stopped, the rotating-speed control unit increases the rotating speed

of the substrate to predetermined target rotating speed at predetermined rotation acceleration or more.