CLAIMS

1. A coating method comprising:

a prewetting step of supplying a prewetting liquid to the center of a first substrate and rotating the first substrate thereby spreading the prewetting liquid over the whole surface of the substrate; and

a coating film forming step of supplying a coating solution to the first substrate supplied with the prewetting liquid and drying the coating solution thereby forming a coating film on the surface of the first substrate;

the coating film forming step including:

a first stage in which the coating solution is supplied to a central portion of the first substrate while the first substrate is rotated;

a second stage in which rotation speed of the first substrate is then decreased and then the first substrate is continuously rotated; and

a third stage in which the rotation speed of the first substrate is then increased to dry the coating solution on the first substrate,

wherein, in the first stage, the first substrate is rotated at a first constant rotation speed immediately before the coating solution is supplied to the first substrate, then the rotation speed of the substrate is gradually increased continuously after starting of supply of the coating solution, and acceleration of the rotation of the first substrate is gradually decreased before completion of discharging of the coating solution, thereby converging the rotation speed of the substrate to a second rotation speed higher than the first rotation speed, and

wherein the prewetting liquid used in the prewetting step is a mixed liquid obtained by mixing a solvent capable of dissolving components of the coating film and a high surface tension liquid having a surface tension higher than that of the solvent, the mixed liquid having a surface tension higher than that of the coating solution,

wherein the solvent is a mixture of PGME (propylene glycol monomethyl ether) and PGMEA (propylene glycol monomethyl ether acetate), wherein the high surface tension liquid is pure water, and wherein the mixed liquid, which is obtained by mixing the solvent and the high surface tension liquid, has a high surface tension liquid content of from 10 to 25 % by volume.

2. The coating method according to claim 1, wherein the solvent and the high surface tension liquid are separately provided and the solvent and the high surface tension liquid are mixed when the prewetting liquid is supplied.

3. The coating method according to claim 1 or 2, further comprising:

a prewetting step of supplying a prewetting liquid to the center of a second substrate and rotating the second substrate thereby spreading the prewetting liquid over the whole surface of the substrate; and

a coating film forming step of supplying, to the second substrate supplied with the prewetting liquid, a coating solution having a surface tension different from that of the coating solution supplied to the first substrate and drying the coating solution thereby forming a coating film on the surface of the second substrate,

wherein operations for the prewetting step and the coating film forming step for each of the first and second substrates are performed by using an identical coating apparatus, and

wherein the surface tension of the prewetting liquid used in the prewetting step for the second substrate is different from the surface tension of the prewetting liquid used in the prewetting step for the first substrate, and the prewetting liquids having different surface tensions are obtained by mixing an identical solvent and an identical high surface tension liquid at different mixing ratios.

~~4. The coating method according to any one of claims 1 to 3, wherein the high surface tension liquid is GBL (γ-butyrolactone).~~

~~5. The coating method according to any one of claims 1 to 3, wherein the high surface tension liquid is pure water.~~

~~6. The coating method according to any one of claims 1 to 5, wherein the solvent is a mixture of PGME (propylene glycol monomethyl ether) and PGMEA (propylene glycol monomethyl ether acetate).~~

~~7. The coating method according to any one of claims 1 to 5, wherein the solvent is CHN (cyclohexanone).~~

~~8. A coating method comprising:~~

~~a prewetting step of supplying a prewetting liquid to the center of a first substrate and rotating the first substrate thereby spreading the prewetting liquid over the whole surface of the first substrate; and~~

~~a coating film forming step of supplying a coating solution to the first substrate supplied with the prewetting liquid and drying the coating solution, thereby forming a coating film on the surface of the first substrate,~~

~~wherein the prewetting liquid is a mixed liquid, which is obtained by mixing a solvent capable of dissolving components of the coating film and a high surface tension liquid, and which has a surface tension higher than that of the solvent,~~

~~wherein the solvent and the high surface tension liquid are separately prepared, and~~

~~wherein the solvent and the high surface tension liquid are mixed when the prewetting liquid is supplied.~~

~~9. The coating method according to claim 8, further comprising:~~

~~a prewetting step of supplying a prewetting liquid to the center of a second substrate and rotating the second substrate thereby diffusing the prewetting liquid over the whole surface of the substrate; and~~

~~a coating film forming step of supplying, to the second substrate supplied with the prewetting liquid, a coating solution having a surface tension different from that of the coating solution supplied to the first substrate and drying the coating solution thereby forming a coating film on the surface of the second substrate,~~

~~wherein operations for the prewetting step and the coating film forming step for each of the first and second substrates are performed by using an identical coating apparatus, and~~

~~wherein the surface tension of the prewetting liquid used in the prewetting step for the second substrate is different from the surface tension of the prewetting liquid~~

~~used in the prewetting step for the first substrate, and the prewetting liquids having different surface tensions are obtained by mixing an identical solvent and an identical high surface tension liquid at different mixing ratios.~~

~~10. A coating apparatus comprising:~~

~~a spin chuck for holding and rotating a substrate;~~

~~at least one coating solution nozzle for supplying a coating solution to the surface of the substrate held by the spin chuck;~~

~~at least one prewetting nozzle for supplying a prewetting liquid to the surface of the substrate held by the spin chuck;~~

~~a coating solution supply mechanism for supplying the coating solution to the coating solution nozzle; and~~

~~a prewetting liquid supply mechanism for supplying the prewetting liquid to the prewetting nozzle,~~

~~wherein the prewetting liquid supply mechanism includes a prewetting liquid supply control section connected to a supply source for a solvent capable of dissolving components of a coating film and a supply source for a high surface tension liquid having a surface tension higher than that of the solvent, the prewetting liquid supply control section being configured to mix the solvent and the high surface tension liquid and supply the mixture to the prewetting nozzle, and~~

~~wherein the prewetting liquid supply control section is configured to variably control the mixing ratio of the solvent and the high surface tension liquid.~~

~~11. The coating apparatus according to claim 10,~~

~~wherein the coating apparatus has a first prewetting nozzle and a second prewetting nozzle as at least one prewetting nozzle,~~

~~wherein the prewetting liquid supply mechanism includes:~~

~~a first line having one end connected to the supply source for the solvent and the other end connected to the first prewetting nozzle,~~

~~a second line having one end connected to the supply source for the high surface tension liquid and the other end connected to the second prewetting nozzle, and~~

~~a connection line for connecting the second line with the first line, and~~

~~wherein the prewetting liquid supply control section is configured to selectively provide a first state in which a prewetting liquid consisting only of the solvent supplied from the first prewetting nozzle and a second state in which a prewetting liquid comprising a mixed liquid of the solvent and the high surface tension liquid is supplied from the second prewetting nozzle, the prewetting liquid supply control section is configured to variably control the mixing ratio between the solvent and the high surface tension liquid in the second state.~~

~~12. The coating apparatus according to claim 11, wherein the prewetting liquid supply control section includes a first flow rate control valve disposed on the first line, a second flow rate control valve disposed on the second line, and a third flow rate control valve disposed on the connection line.~~

~~13. The coating apparatus according to any one of claims 10 to 12, wherein the coating solution supply mechanism is configured to supply at least two types of coating solutions having different surface tensions to the surface of the substrate held by the spin chuck by way of at least one coating solution nozzle.~~

~~14. The coating apparatus according to any one of claims 10 to 13, wherein the high surface tension liquid is GBL (γ-butyrolactone).~~

~~15. The coating apparatus according to any one of claims 10 to 13, wherein the high surface tension liquid is pure water.~~

~~16. The coating apparatus according to any one of claims 10 to 15, wherein the solvent is a mixture of PGME (propylene glycol monomethyl ether) and PGMEA (propylene glycol monomethyl ether acetate).~~

~~17. The coating apparatus according to any one of claims 10 to 15, wherein the solvent is CHN (cyclohexanone).~~