SUMMARY OF THE DISCLOSURE

TECHNICAL PROBLEM

[0004]

However, as a result of studies by the present inventor, it has been found that, in the surface treatment method for a semiconductor substrate disclosed in Patent Document 1, there is room for improvement in terms of manufacturing controllability and manufacturing stability.

SOLUTION TO PROBLEM

[0005]

As a result of further studies by the present inventor, the following findings have been obtained.

In a case of using a semiconductor substrate that has, on a main surface, a pattern formation region on which a fine pattern is formed and a pattern non-formation region, a surface of the pattern formation region can be surface-treated, and a contact angle with 2-propanol (hereinafter, also referred to as an IPA contact angle) or a contact angle with pure water (hereinafter, also referred to as a water contact angle) on a surface of the pattern non-formation region after the surface treatment can be measured. That is, since it is possible to evaluate the surface treatment on the pattern and the IPA contact angle or the water contact angle on the surface after the surface treatment on the same semiconductor substrate, management of a manufacturing process is easier compared with a case of using another dummy substrate.

As a result of intensive studies based on such findings, it has

been found that, by adopting the IPA contact angle or the water contact angle on the surface in the pattern non-formation region as an index, a pattern collapse rate in the pattern formation region can be evaluated stably, and by setting the IPA contact angle or the water contact angle within a specified range, a pattern collapse can be suppressed, and the present disclosure has been completed.

[0006]

In an aspect, a treatment method of treating a main surface of a semiconductor substrate that has, on the main surface of the substrate, a pattern formation region in which a pattern having a concave-convex structure with a pattern dimension of 30 nm or less is formed and a pattern non-formation region in which no pattern is formed, the method comprising a surface treatment step of bringing a surface treatment agent composition including a silylating agent into contact with the pattern formation region and the pattern non-formation region on the main surface of the semiconductor substrate, wherein, with respect to a surface of the pattern non-formation region after the surface treatment step, an IPA contact angle with 2-propanol is 2° or more at a room temperature of 25°C and/or a water contact angle with pure water is 50° or more at the room temperature of 25°C, is provided.

[0006a]

In another aspect, there is provided a treatment method of treating a main surface of a semiconductor substrate that has, on the main surface of the substrate, a pattern formation region in which a pattern having a concave-convex structure with a pattern dimension of 30 nm or less is formed and a pattern non-formation region in which

no pattern is formed, the method comprising a surface treatment step of bringing a surface treatment agent composition including a silylating agent into contact with the pattern formation region and the pattern non-formation region on the main surface of the semiconductor substrate; and an evaluation step of determining whether or not, with respect to a surface of the pattern non-formation region after the surface treatment step, an IPA contact angle with 2-propanol is 2° or more and/or a water contact angle with pure water is 50° or more.

[0007]

In another aspect, there is provided a surface treatment agent composition used for treating a main surface of a semiconductor substrate that has, on the main surface of the substrate, a pattern formation region in which a pattern having a concave-convex structure with a pattern dimension of 30 nm or less is formed and

a pattern non-formation region in which no pattern is formed, the surface treatment agent composition comprising a silylating agent, wherein an IPA contact angle obtained by the following procedure is 2° or more and/or a water contact angle obtained by the following procedure is 50° or more,

(Procedure)

the surface treatment agent composition is brought into contact with the pattern formation region and the pattern non-formation region on the main surface of the semiconductor substrate, and

after contacting the surface treatment agent composition, on the surface of the pattern non-formation region, a contact angle with 2-propanol is measured at a room temperature of 25°C and a value of the contact angle is defined as the IPA contact angle (°), and a contact angle with pure water is measured at the room temperature of 25°C and a value of the contact angle is defined as the water contact angle (°).

ADVANTAGEOUS EFFECTS OF DISCLOSURE

[0008]

According to the present disclosure, a surface treatment method for a semiconductor substrate, which is excellent in manufacturing controllability and manufacturing stability, and a surface treatment agent composition used therein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a top view schematically showing a configuration of