KIT, METHOD FOR MANUFACTURING SEMICONDUCTOR ELEMENT, AND METHOD FOR CLEANING SUBSTRATE OF SEMICONDUCTOR ELEMENT

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a kit, a method for manufacturing a semiconductor element, and a method for cleaning a substrate of a semiconductor element.

2. Description of the Related Art

[0002] A detergent composition for removing a temporary bonding material has hitherto been studied.

For example, JP2016-011361A discloses a peeling composition for peeling a bonding material including a styrene-based hydrogenated elastomer, in which the peeling composition includes at least one of a cyclic terpene-based solvent, a nonionic surfactant, or a silicon-based surfactant.

Furthermore, JP2006-505629A discloses a composition including A) a water-soluble organic solvent, B) a sulfonic acid or a salt corresponding thereto, and C) water.

In addition, JP2004-307725A discloses a cleaning liquid composition used in cleaning a semiconductor substrate having a contact angle of the surface of 70 degrees or more upon dropwise addition of water, in which the cleaning liquid composition includes aliphatic polycarboxylic acids and an organic solvent having a hydroxyl group and/or an ether group, and a contact angle upon dropwise addition of the cleaning liquid composition onto a semiconductor substrate is 40° or less.

SUMMARY

[0003a] In one aspect, the present disclosure refers to a kit comprising:

a temporary bonding material including at least one silicon-containing compound selected from the group consisting of a silicone compound and a precursor of the silicone compound;

a detergent composition A including at least one organic acid in which an acid group included in the organic acid contains a sulfur atom or a phosphorus atom, and an organic solvent; and

a detergent composition B including an organic carboxylic acid compound and at least one of water or a water-soluble solvent.

[0003b] In another aspect, the present disclosure refers to a method for manufacturing a

semiconductor element, comprising:

cleaning a substrate having a silicone compound on a surface thereof using a detergent composition A; and

further cleaning the cleaned substrate using a detergent composition B,

wherein the detergent composition A includes at least one organic acid in which an acid group included in the organic acid contains a sulfur atom or a phosphorus atom, and an organic solvent, and

the detergent composition B includes an organic carboxylic acid compound and at least one of water or a water-soluble solvent.

[0003c] In a further aspect, the present disclosure refers to a method for cleaning a substrate of a semiconductor element, comprising:

cleaning a substrate having a silicone compound on a surface thereof using a detergent composition A; and

further cleaning the cleaned substrate using a detergent composition B,

wherein the detergent composition A includes at least one organic acid in which an acid group included in the organic acid contains a sulfur atom or a phosphorus atom, and an organic solvent, and

the detergent composition B includes an organic carboxylic acid compound and at least one of water or a water-soluble solvent.

[0004] However, according to the studies conducted by the present inventors, it was found that in a case where a temporary bonding material including a silicone compound or a precursor of the silicone compound (hereinafter simply referred to as a “silicon-containing compound” in some cases) is cleaned with such a detergent composition as described above, carbon atom residues or silicon atom residues derived from the temporary bonding material remain. In this regard, the present applicant has studied on removal of the residues using a composition including an organic sulfonic acid and an organic solvent. However, it was found that in a case where a temporary bonding material including a silicon-containing compound is cleaned with a composition including an organic sulfonic acid and an organic solvent, sulfur atom residues derived from the organic sulfonic acid remain. With such sulfur atom residues, acid

components may cause corrosion of a metal surface, disconnection of a metal wiring, or the like in a case where a substrate to be processed, which is subjected to temporary bonding, has a metal such as a copper and there are many irregularities on the surface of the metal. The present disclosure has been made to solve such problems, and thus has an object to provide a kit which includes a temporary bonding material including a silicon-containing compound and a detergent for the temporary bonding material and is capable of appropriately cleaning various residues; a method for manufacturing a semiconductor element; and a method for cleaning a substrate of a semiconductor element.

[0005] The present inventors have studied so as to achieve the objects, and as a result, they have found that by cleaning a temporary bonding material including a silicon-containing compound with a detergent composition including an organic sulfonic acid and the like, and then further cleaning the temporary bonding material with a detergent composition including an organic carboxylic acid, water, and the like, it is possible to effectively remove residues derived from the silicon-containing compound, and also effectively remove residues derived from the organic sulfonic acid and the like, thereby leading to completion of the present disclosure.

Specifically, according to <1>, and preferably according to <2> to <29>, the objects were accomplished.

<1> A kit comprising:

a temporary bonding material including at least one silicon-containing compound selected from the group consisting of a silicone compound and a precursor of the silicone compound;

a detergent composition A including at least one organic acid in which an acid group included in the organic acid contains a sulfur atom or a phosphorus atom, and an organic solvent; and

a detergent composition B including an organic carboxylic acid compound and at least one of water or a water-soluble solvent.

<2> The kit as described in <1>,

in which the organic acid includes at least one organic acid selected from the group consisting of an organic sulfonic acid, an organic phosphoric acid, and an organic phosphonic acid.

<3> The kit as described in <1>,

in which the silicon-containing compound includes a silicone oil.

<23> The method for manufacturing a semiconductor element as described in any one of <19> to <22>, further comprising a drying step after each of the step of performing cleaning using the detergent composition A and the step of performing cleaning using the detergent composition B.

<24> The method for manufacturing a semiconductor element as described in any one of <19> to <23>,

in which a period from the start of the step of performing cleaning using the detergent composition A to the end of the step of performing cleaning using the detergent composition B for one sheet of the substrate is 30 to 300 seconds.

<25> The method for manufacturing a semiconductor element as described in any one of <19> to <24>, further comprising a step of performing a rinsing treatment using a rinsing composition C including at least one of water or an alcohol after the step of performing cleaning using the detergent composition B.

<26> The method for manufacturing a semiconductor element as described in any one of <19> to <25>, using the kit as described in any one of <1> to <18>.

<27> A method for cleaning a substrate of a semiconductor element, comprising:

a step of cleaning a substrate having a silicone compound on a surface thereof using a detergent composition A; and

a step of further cleaning the cleaned substrate using a detergent composition B,

in which the detergent composition A includes at least one organic acid in which an acid group included in the organic acid contains a sulfur atom or a phosphorus atom, and an organic solvent, and the detergent composition B includes an organic carboxylic acid compound and at least one of water or a water-soluble solvent.

<28> The method for cleaning a substrate of a semiconductor element as described in <27>, further comprising performing a rinsing treatment using a rinsing composition C including at least one of water or an alcohol after the step of performing cleaning using the detergent composition B.

<29> The method for cleaning a substrate of a semiconductor element as described in <27> or <28>, using the kit as described in any one of <1> to <18>.

[0006] According to the present disclosure, it is possible to provide a kit which includes a temporary bonding material including a silicon-containing compound and a detergent for the temporary bonding material and is capable of appropriately cleaning various residues; a method for manufacturing a semiconductor element; and a method for cleaning a substrate of a