CLAIMS

1. A dry etching method comprising a dry etching step in which an etching gas containing a halogen fluoride being a compound of bromine or iodine and fluorine is brought into contact with a member to be etched including an etching target being a target of etching with the etching gas to etch the etching target without using plasma,

wherein the etching target contains copper;

wherein the dry etching step is performed under temperature conditions of from 140°C to 300°C;

wherein the etching gas is a mixed gas containing the halogen fluoride, inert gas, and oxygen gas; and

wherein an amount of the oxygen gas contained in the etching gas is 1% by volume or less.

2. The dry etching method according to claim 1, wherein the inert gas is at least one selected from nitrogen gas, helium, argon, neon, krypton, and xenon.

3. The dry etching method according to claim 1 or 2, wherein an amount of the halogen fluoride contained in the etching gas is from 1% by volume to 90% by volume.

4. The dry etching method according to any one of claims 1 to 3, wherein the halogen fluoride is at least one of bromine pentafluoride or iodine heptafluoride.

5. The dry etching method according to any one of claims 1 to 4, wherein the dry etching step is performed under pressure conditions of from 50 Pa to 80 kPa.

6. The dry etching method according to any one of claims 1 to 5, wherein the etching target contains at least one of a copper compound containing at least one type of atom among oxygen, nitrogen, and halogen atoms and copper or elemental copper.

7. The dry etching method according to any one of claims 1 to 6, wherein the dry etching step is performed under temperature conditions of from 210°C to 280°C.

8. The dry etching method according to any one of claims 1 to 7, wherein the member to be etched includes a non-etching target not being the target of the etching with the etching gas and the etching target, the etching target being selectively etched compared to the non-etching target.

9. The dry etching method according to claim 8, wherein the non-etching target is at least one selected from silicon oxide, photoresist, and amorphous carbon.

10. The dry etching method according to claim 8 or 9, wherein an etching selectivity ratio being a ratio of an

etching rate of the etching target to an etching rate of the non-etching target is 5 or more.

11. A method for manufacturing a semiconductor element, the method using the dry etching method according to any one of claims 1 to 10 to manufacture the semiconductor element,

wherein the member to be etched is a semiconductor substrate including the etching target; and

wherein the manufacturing method comprises a processing step of removing at least a part of the etching target from the semiconductor substrate by the dry etching method.

12. The method for manufacturing a semiconductor element according to claim 11, wherein copper wiring is formed on the semiconductor substrate by the processing step.

13. A cleaning method for cleaning an inner surface of a chamber of a semiconductor element manufacturing device using the dry etching method according to any one of claims 1 to 10,

wherein the member to be etched is the chamber, the chamber having, on the inner surface, a deposit adhered due to operation of the semiconductor element manufacturing device, and the deposit being the etching target; and

wherein the cleaning method comprises a cleaning step of removing the deposit from the inner surface of the chamber by the dry etching method.