CLAIMS

1. A thin film formed on a wafer by sputtering a high-purity copper-manganese-alloy sputtering target comprising 0.05 to 20 wt.% of Mn, 2 wt ppm or less of C, ~~and~~ the remainder being Cu and inevitable impurities, wherein ~~in formation of a film on a wafer by sputtering the target,~~ the number of particles composed of C, at least one element selected from Mn, Si, and Mg, or a compound composed of C and at least one element selected from Mn, Si, and Mg and having a diameter of 0.08 μm or more is 50 or less on average.

2. The thin film ~~high-purity copper-manganese-alloy sputtering target~~ according to ~~Claim~~ claim 1, wherein the number of particles having a diameter of 0.08 μm or more is 20 or less on average.

3. A thin film formed on a wafer by sputtering a high-purity copper-manganese-alloy sputtering target comprising 0.05 to 20 wt.% of Mn, 2 wt ppm or less of C, ~~and~~ the remainder being Cu and inevitable impurities, wherein ~~in formation of a film on a wafer by sputtering the target,~~ the number of particles composed of C, at least one element selected from Mn, Si, and Mg, or a compound composed of C and at least one element selected from Mn, Si, and Mg and having a diameter of 0.20 μm or more is 30 or less on average.

4. The thin film ~~high-purity copper-manganese-alloy sputtering target~~ according to ~~Claim~~ claim 3, wherein the number of particles having a diameter of 0.20 μm or more is 10 or less on average.

5. A method of producing a high-purity copper-manganese-alloy sputtering target comprising 0.05 to 20 wt.% of Mn, 2 wt ppm or less of C, the remainder being Cu and inevitable impurities, comprising:

melting copper and manganese in a carbon crucible at 1000°C to 1400°C to form a copper-manganese-alloy ingot;

casting the alloy;

hot-forging the ingot at 500°C to 900°C;

cold-rolling the hot-forged ingot; and

heat-treating at 300°C to 600°C.

6. The method of claim 5, wherein:

the copper has a purity of 99.9999 wt% (6N) or more and the manganese has a purity of 99.999 wt% (5N) or more; or

the copper has a purity of 99.9999 wt% (6N) or more and is melted in advance, and the manganese has a purity of 99.99 wt% (4N) or more and is added to the molten copper.

7. The method of claim 5 or 6, wherein the melting time period is 10 to 30 minutes.

8. The method of any of claims 5 to 7, further comprising:

after cold rolling, hot-rolling at 500°C to 900°C

9. The method of any of claims 5 to 8, further comprising:

sputtering the target to obtain a thin film on a wafer, wherein the number of particles composed of C, at least one element selected from Mn, Si, and Mg, or a compound composed of C and at least one element selected from Mn, Si, and Mg and having a diameter of 0.08 μm or more is 50 or less on average.

10. The method of claim 9, wherein the number of particles having a diameter of 0.08 μm or more is 20 or less on average.

11. The method of any of claims 5 to 8, further comprising:

sputtering the target to obtain a thin film on a wafer, wherein the number of particles composed of C, at least one element selected from Mn, Si, and Mg, or a compound composed of C and at least one element selected from Mn, Si, and Mg and having a diameter of 0.20 μm or more is 30 or less on average.

12. The method of claim 11, wherein the number of particles having a diameter of 0.20 μm or more is 10 or less on average.

13. The method of any of claims 9 to 12, wherein the sputtering is performed in an Ar atmosphere.

ABSTRACT

HIGH-PURITY COPPER-MANGANESE-ALLOY SPUTTERING TARGET

Provided is a high-purity copper-manganese-alloy sputtering target comprising 0.05-20 wt. % of Mn, 2 wt ppm or less of C, the remainder being Cu and inevitable impurities, wherein in formation of a film on a wafer by sputtering the target, the number of particles composed of C, at least one element selected from Mn, Si, and Mg, or a compound composed of C and at least one element selected from Mn, Si, and Mg and having a diameter of 0.20μm or more is 30 or less on average. Particle generation during sputtering can be effectively suppressed by thus adding an appropriate amount of Mn element to copper and controlling the amount of carbon. In particular, a high-purity copper-manganese-alloy sputtering target that is useful for forming semiconductor copper-alloy line having a self-diffusion suppression function is provided.