CLAIMS

1. A bonding wire for semiconductor devices, the bonding wire comprising:

a core material of Cu or Cu alloy, hereinafter referred to as a "Cu core material"; and

a coating containing a noble metal formed on a surface of the Cu core material, hereinafter referred to as a "noble metal coating",

wherein

a concentration of Cu at a surface of the wire is 30 to 80 at%,

the noble metal coating contains Pd,

a maximum concentration of the noble metal in the noble metal coating is 50 at% or more.

2. The bonding wire according to claim 1, wherein the concentration of Cu at the surface is measured by Auger electron spectroscopy (AES) under the following <Condition>:

<Condition> a center of width of a measuring surface is aligned with a center of width of the wire, the width of the measuring surface is 10% or more and 15% or less of a diameter of the wire, and a length of the measuring surface is five times the width of the measuring surface.

3. The bonding wire according to claim 1 or 2, wherein the noble metal coating further contains Au.

4. The bonding wire according to claim 3, wherein, in the noble metal coating, a position indicating a maximum concentration of Au is closer to the surface of the wire than a position indicating a maximum concentration of Pd.

5. The bonding wire according to any one of claims 1 to 4, wherein a maximum concentration of the noble metal in the noble metal coating is determined from a concentration profile in a depth direction that is obtained by performing measurement by Auger electron spectroscopy (AES) under the following <Condition> while digging down the wire from its surface in the depth direction by Ar sputtering:

<Condition> a center of width of a measuring surface is aligned with a center of width of the wire, the width of the measuring surface is 10% or more and 15% or less of a diameter of the wire, and a length of the measuring surface is five times the width of the measuring surface.

6. The bonding wire according to any one of claims 1 to 5, wherein the Cu core material consists of Cu and inevitable impurities.

7. The bonding wire according to any one of claims 1 to 6, wherein the noble metal coating consists of the noble metal and inevitable impurities.

8. The bonding wire according to any one of claims 1 to 5, wherein

the bonding wire contains at least one element selected from the group consisting of Ni, Zn, Rh, In, Ir and Pt, hereinafter referred to as a "first additive element", and

a concentration of the first additive element in total is 0.1 to 1.5% by mass relative to the entire wire.

9. The bonding wire according to any one of claims 1 to 5, and 8, wherein

the bonding wire contains at least one element selected from the group consisting of P, B, Be, Fe, Mg, Ti, Zn, Ag and Si, hereinafter referred to as a "second additive element", and

a concentration of the second additive element in total is 0.1 to 200 ppm by mass relative to the entire wire.

10. The bonding wire according to claim 8 or 9, wherein the Cu core material consists of Cu, at least one element selected from the first additive element and the second additive element, and inevitable impurities.

11. The bonding wire according to any one of claims 8 to 10, wherein the noble metal coating consists of the noble metal, at least one element selected from the first additive element and the second additive element, and inevitable impurities.

12. The bonding wire according to any one of claims 1 to 11, wherein an average crystal grain size in a cross-section of the Cu core material in a direction perpendicular to a wire axis is 1.4 to 3.2 μm.

13. The bonding wire according to any one of claims 1 to 12 being suitable for wedge-wedge bonding.

14. The bonding wire according to any one of claims 1 to 13, wherein the concentration of Cu at the surface of the wire is more than 50 at% and 80 at% or less.

15. A method for manufacturing a semiconductor device, the method comprising:

a step of connecting a first electrode on a semiconductor element to a second electrode on a lead frame or circuit board with using the bonding wire according to any one of claims 1 to 14, wherein

a first connection between the first electrode and the bonding wire and a second connection between the second electrode and the bonding wire are both performed by wedge bonding.

16. The method according to claim 15, wherein the first connection and the second connection are performed at the room temperature.

17. A semiconductor device comprising the bonding wire according to any one of claims 1 to 14.