

CLAIMS

1. A copper paste for pressureless bonding, containing:

metal particles; and
a dispersion medium,

wherein the metal particles include sub-micro copper particles having a volume average particle diameter of greater than or equal to $0.01\text{ }\mu\text{m}$ and less than or equal to $0.8\text{ }\mu\text{m}$, and micro copper particles having a volume average particle diameter of greater than or equal to $2.0\text{ }\mu\text{m}$ and less than or equal to $50\text{ }\mu\text{m}$,

the dispersion medium contains a solvent having a boiling point of higher than or equal to 300°C , and a content of the solvent having a boiling point of higher than or equal to 300°C is greater than or equal to 2 mass% on the basis of a total mass of the copper paste for pressureless bonding, and

when the copper paste for pressureless bonding that exists between two members is heated at a temperature of higher than or equal to 250°C and lower than 350°C , the micro copper particles and the sub-micro copper particles are sintered, metal bonding is formed, and the two members are bonded together at a die shear strength of greater than or equal to 10 MPa and a thermal conductivity of greater than or equal to $100\text{ W/(m}\cdot\text{K)}$.

2. A copper paste for pressureless bonding, containing:

metal particles; and
a dispersion medium,

wherein the metal particles include sub-micro copper particles having a volume average particle diameter of greater than or equal to $0.01\text{ }\mu\text{m}$ and less than or equal to $0.8\text{ }\mu\text{m}$, and micro copper particles having a volume average particle diameter of greater than or equal to $2.0\text{ }\mu\text{m}$ and less than or equal to $50\text{ }\mu\text{m}$,

the dispersion medium contains a solvent having a boiling point of higher than or equal to 300°C , and a content of the solvent having a boiling point of higher than or equal to 300°C is greater than or equal to 8 volume% on the basis of a total volume of the copper paste for pressureless bonding, and

when the copper paste for pressureless bonding that exists between two members is heated at a temperature of higher than or equal to 250°C and lower than 350°C , the micro copper particles and the sub-micro copper particles are sintered, metal bonding is formed, and the two members are bonded together at a die shear strength of greater than or equal to 10 MPa and a thermal conductivity of greater than or equal to $100\text{ W/(m}\cdot\text{K)}$.

3. The copper paste for pressureless bonding according to claim 1,

wherein the solvent having a boiling point of higher than or equal to 300°C has at least one type of group selected from the group consisting of a hydroxy group, an ether group, and an ester group.

4. The copper paste for pressureless bonding according to claim 1,

wherein the content of the solvent having a boiling point of higher than or equal to 300°C that remains when a temperature rises to 300°C from 25°C is greater than or equal to 1 mass% on the basis of a mass of the copper paste for pressureless bonding when a temperature rises to 300°C.

5. A bonded body, comprising:

a first member;

a second member having a thermal expansion rate different from that of the first member; and

a sintered body of the copper paste for pressureless bonding according to claim 1, the sintered body bonding the first member and the second member together.

6. A manufacturing method of a bonded body, comprising:

a step of preparing a laminated body in which a first member, the copper paste for pressureless bonding according to claim 1, and a second member having a thermal expansion rate different from that of the first member are laminated in this order in a direction side in which self-weight of the first member acts, and of sintering the copper paste for pressureless bonding in a state of receiving the self-weight of the first member, or the self-weight of the first member and a pressure of less than or equal to 0.01 MPa.

7. A semiconductor device, comprising:

a first member;

a second member having a thermal expansion rate different from that of the first member; and

a sintered body of the copper paste for pressureless bonding according to claim 1, the sintered body bonding the first member and the second member together,

wherein at least one of the first member and the second member is a semiconductor element.

8. The copper paste for pressureless bonding according to claim 2,

wherein the solvent having a boiling point of higher than or equal to 300°C has at least one type of group selected from the group consisting of a hydroxy group, an ether group, and an ester group.

9. The copper paste for pressureless bonding according to claim 2, wherein the content of the solvent having a boiling point of higher than or equal to 300°C that remains when a temperature rises to 300°C from 25°C is greater than or equal to 1 mass% on the basis of a mass of the copper paste for pressureless bonding when a temperature rises to 300°C.