Claims

1. A composition for forming a copper-containing interlayer between a first solid substrate and a second solid substrate which composition comprises or consists of the following components:

   An organic binder and flakes of copper or a copper alloy, wherein the flakes comprise internal pores, wherein the flakes have a multi-layer lamellar structure, wherein the internal pores are totally surrounded by the copper or the copper alloy, wherein any one of the internal pores has a diameter in a range of 2 nm to 30 nm, wherein the flakes have a mean particle size D50 determined by laser granulometry of at most 5 µm, wherein the flakes comprising internal pores have a mean intraparticle pore density in a range of 2 internal pores/µm² to 30 internal pores/µm² in an arbitrary section through any of the flakes, wherein the multi-layer lamellar structure comprises or consists of at least two and of at most 20 lamellas, wherein any one of the lamellas has independently from each other a thickness in the range of 5 nm to 20 nm, wherein the organic binder is a terpineol, a primary alcohol, a diol, a triol, a polymeric glycol or a mixture of at least two of a terpineol, a primary alcohol, a diol, a triol and a polymeric glycol, wherein the total weight of the flakes is at most 80 wt.% of the total weight of the composition, wherein the remaining part of the composition is formed by the organic binder, wherein the mean intraparticle pore density of the flakes of copper or the copper alloy is determined by

   - embedding the flakes in a resin,

   - preparing ultrathin sections of the embedded flakes,

   - taking transmission electron microscopic (TEM) images and/or scanning electron microscopy (SEM) images of the ultrathin sections of the embedded flakes,

- determining a plurality of intraparticle pore densities by calculating the number of internal pores within the ultrathin sections of the flakes in relation to the total area of these ultrathin sections of the flakes, in a plurality of TEM images and/or in a plurality of SEM images, and

- calculating the mean of the plurality of intraparticle pore densities determined in this way.

2. Composition according to claim 1, wherein the copper alloy is bronze or brass.

3. Composition according to claim 1 or 2, wherein the flakes comprising internal pores have a mean intraparticle pore density in a range of 10 internal pores/µm² to 30 internal pores/µm², in particular in a range of 15 internal pores/µm² to 20 internal pores/µm², in an arbitrary section through any of the flakes.

4. Composition according to any of the preceding claims, wherein the flakes are coated with stearic acid, wherein the total weight of stearic acid in relation to the total weight of the flakes coated with stearic acid is at most 1.5 wt.%.

5. Composition according to any of the preceding claims, wherein the flakes have a total oxygen content in a range of 4.1 wt.% to 7.5 wt.%.

6. Composition according to any of the preceding claims, wherein the organic binder is a mixture of at least two of a terpineol, a primary alcohol, a diol and a triol.

7. Composition according to any of the preceding claims, wherein the terpineol is an alpha-terpineol, and wherein the primary alcohol is 1-butanol or 1-

octanol, and wherein the diol is a diol having an average molar mass of at least 60 g/mol and at most 110 g/mol, in particular ethylene glycol, diethylene glycol, propylene glycol or butylene glycol, and wherein the triol is a triol having an average molar mass of at least 75 g/mol and at most 110 g/mol, in particular glycerol.

8. Composition according to any of the preceding claims, wherein the total weight of the flakes is at most 63 wt.%, in particular at most 60 wt.%, in particular at most 55 wt.%, of the total weight of the composition, wherein the total weight of the organic binder is at least 37 wt.%, in particular at least 40 wt.%, in particular at least 45 wt.%, respectively, of the total weight of the composition.

9. A method for forming a copper-containing interlayer between a first solid substrate and a second solid substrate, the method comprising the steps of

a) providing the composition according to any of claims 1 to 8, providing a first substrate and providing a second substrate,

b) applying the composition to the first substrate,

c) placing the second substrate on the composition,

d) applying a bonding pressure to press the first substrate and the second substrate against one another, wherein the bonding pressure is at least 100 kPa and at most 40 MPa,

e) heating the composition on the first substrate or the first substrate and/or the second substrate together with the composition to a sintering temperature in a range of 200 °C to 300 °C and maintaining the sintering temperature and the bonding pressure until a copper-

containing interlayer between the first substrate and the second substrate is formed.

10. Method according to claim 9, wherein the sintering temperature is in a range of 215 °C to 265 °C, in particular in a range of 225 °C to 255 °C, and wherein the bonding pressure is at least 1 MPa, in particular at least 5 MPa, and at most 25 MPa, in particular at most 10 MPa, and/or wherein the sintering temperature and the bonding pressure are maintained for at least 1 second, in particular for at least 30 seconds, and for at most 30 minutes, in particular for at most 5 minutes.

11. Method according to claim 9 or 10, wherein at least step e) is performed in an inert atmosphere.

12. Use of the composition according to any of claims 1 to 8 for forming a copper-containing interlayer between two surfaces of solid substrates, for forming a conductive path on a solid substrate or for substrate attachment.