Claims

1. A coated metal foil for forming a copper-containing interlayer between a first solid substrate and a second solid substrate or between a solid substrate and the metal foil, wherein the coated metal foil comprises or consists of

   a metal foil of copper or of a first copper alloy or of a copper plated nickel-iron alloy, wherein the metal foil has a first surface and a second surface, and a composition coated on the first surface and/or the second surface of the metal foil, wherein the composition comprises or consists of the following components:

   an organic binder and flakes of copper, of the first copper alloy or of a second copper alloy, wherein the flakes comprise internal pores, wherein the total weight of the flakes in relation to the total weight of the composition is in a range of 10 wt.% to 80 wt.%, wherein the flakes have a mean intraparticle pore density in a range of 2 internal pores/µm² to 40 internal pores/µm² in an arbitrary section through any of the flakes, wherein the metal foil has a thickness of at least 5 µm and at most 200 µm, wherein the composition is coated on the first surface and/or the second surface of the metal foil in each case independently from each other in a thickness of at least 1 µm and at most 500 µm.

2. Coated metal foil according to claim 1, wherein the composition is coated on the first surface and a further composition is coated on the second surface, wherein the further composition comprises or consists of the organic binder or a further organic binder and the flakes or further flakes of copper, of the first copper alloy or of the second copper alloy, wherein the further flakes comprise internal pores.

3. Coated metal foil according to claim 1 or 2, wherein the flakes and/or the further flakes of copper, of the first copper alloy or of the second copper

alloy have a mean intraparticle pore density in a range of 7 internal pores/μm² to 30 internal pores/μm².

4. Coated metal foil according to any of the preceding claims, wherein grains in the metal foil at the first surface and/or the second surface of the metal foil have an average grain size of at least 2 μm and at most 100 μm and/or grains in the flakes and/or the further flakes independently from each other have an average grain size of at least 20 nm and at most 200 nm and/or wherein a ratio of the average grain size of the grains in the flakes to the average grain size of the grains at the first surface and/or the second surface of the metal foil and/or of the average grain size of the grains in the further flakes to the average grain size of the grains at the second surface of the metal foil in each case does not exceed 0.002.

5. Coated metal foil according to any of the preceding claims, wherein the first copper alloy is bronze or brass and/or wherein the metal foil has a thickness of at least 5 μm and at most 150 μm, in particular at most 100 μm.

6. Coated metal foil according to any of the preceding claims, wherein the flakes and/or the further flakes are of the second copper alloy and the second copper alloy is bronze or brass, and/or wherein the flakes and/or the further flakes have a mean particle size D50 determined by laser granulometry of at most 5 μm.

7. Coated metal foil according to any of the preceding claims, wherein the flakes and/or the further flakes have a multi-layer lamellar structure.

8. Coated metal foil according to any of the preceding claims, wherein the flakes and/or the further 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 and/or of the further flakes coated with stearic acid is in each case independently from each other at most 1.5 wt.%.

9. Coated metal foil according to any of the preceding claims, wherein the organic binder and/or the further organic binder is in each case independently from each other 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.

10. Coated metal foil according to any of the preceding claims, wherein the composition and/or the further composition independently from each other further comprise(s) turpentine or a polar organic solvent, in particular an alcohol, acetone or a mixture of an alcohol and acetone.

11. Coated metal foil according to any of the preceding claims, wherein 10 % to 100 %, in particular 50 % to 100 %, of an area of the first surface and/or of an area of the second surface of the metal foil are independently from each other coated with the composition, and/or wherein the composition is coated on the first surface and/or the second surface of the metal foil in each case independently from each other in a thickness of at least 1 µm and at most 50 µm, or wherein 10 % to 100 %, in particular 50 % to 100 %, of an area of the first surface of the metal foil is coated with the composition and 10 % to 100 %, in particular 50 % to 100 %, of an area of the second surface of the metal foil is coated with the further composition, and/or wherein the composition is coated on the first surface and the further composition is coated on the second surface of the metal foil in each case independently from each other in a thickness of at least 1 µm and at most 500 µm, in particular least 1 µm and at most 50 µm.

12. A method for producing the coated metal foil according to any of the preceding claims comprising the steps of

    a) providing

- the metal foil of copper or of a first copper alloy or of a copper plated nickel–iron alloy, wherein the metal foil has a first surface and a second surface, wherein the metal foil has a thickness of at least 5 µm and at most 200 µm,

- the flakes and optionally the further flakes of copper or of the first copper alloy or of a second copper alloy, wherein the flakes and the further flakes comprise internal pores, wherein the flakes have a mean intraparticle pore density in a range of 2 internal pores/µm² to 40 internal pores/µm² in an arbitrary section through any of the flakes, and

- the organic binder and optionally the further organic binder,

b) mixing the flakes and the organic binder for obtaining a composition and optionally the flakes or the further flakes and the organic binder or the further organic binder for obtaining a further composition, wherein the total weight of the flakes in relation to the total weight of the composition is in a range of 10 wt.% to 80 wt.%, and

c) applying the composition obtained in step b) to the first surface and/or the second surface of the metal foil or applying the composition obtained in step b) to the first surface of the metal foil and the further composition obtained in step b) to the second surface of the metal foil for obtaining the coated metal foil, wherein the composition obtained in step b) is applied to the first surface and/or the second surface of the metal foil in each case independently from each other in a thickness of at least 1 µm and at most 500 µm.

13. Method according to claim 12, wherein the metal foil is of bronze or brass and/or has a thickness of at least 5 µm and at most 150 µm, in particular at most 100 µm, and/or the flakes and/or the further flakes are of the second

copper alloy and the second copper alloy is bronze or brass, and/or the flakes and/or the further flakes have a mean particle size D50 determined by laser granulometry of at most 5 µm and/or the flakes and/or the further flakes have a multi-layer lamellar structure and/or the flakes and/or the further 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 and/or the further flakes coated with stearic acid is in each case independently from each other at most 1.5 wt.% and/or the organic binder and/or the further organic binder is in each case independently from each other 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.

14. Method according to claim 12 or 13, wherein before step c) the metal foil is heated to a first pre-treatment temperature in the range of 170 °C to 220 °C for at least 1 minute and at most 2 hours and cooled to a second pre-treatment temperature in the range of 15 °C to 40 °C.

15. Method according to any of claims 12 to 14, wherein after step c) the metal foil is heated to a pre-drying temperature in the range of 100 °C to 160 °C for at least 1 minute and at most 30 minutes or wherein during step c) and after the composition obtained in step b) was applied to the first surface, the metal foil is heated to a pre-drying temperature in the range of 100 °C to 160 °C for at least 1 minute and at most 30 minutes followed by a cooling step, application of the composition or the further composition obtained in step b) to the second surface and heating the metal foil to the pre-drying temperature in the range of 100 °C to 160 °C for at least 1 minute and at most 30 minutes.

16. Use of the coated metal foil according to any of claims 1 to 11 for forming a copper-containing interlayer between two surfaces of solid substrates or

between a surface of a solid substrate and the metal foil, for forming a conductive path on a solid substrate or for substrate attachment.