Claims:

1. A sintering powder comprising:

a particulate having a mean longest diameter of less than 10 microns, wherein at least some of the particles forming the particulate comprise a metal at least partially coated with a capping agent.

2. The sintering powder of claim 1 wherein the capping agent comprises an amine and/or a carboxylate functional group.

3. The sintering powder of claim 1 or claim 2 wherein the capping agent comprises a straight chain or branched chain aliphatic amine, preferably octylamine.

4. The sintering powder of any preceding claim wherein the metal comprises silver or an alloy thereof.

5. The sintering powder of any preceding claim comprising up to 5 wt% capping agent, preferably from 0.1 to 3 wt% capping agent, more preferably about 1 wt% capping agent.

6. The sintering powder of any preceding claim, wherein the particulate comprises a first type of particles having a longest diameter of from 1 to 100 nm and a second type of particles having a longest diameter of from greater than 100 nm to 50 microns.

7. The sintering powder of claim 6, wherein the first type of particles have a diameter of from 5 to 75 nm and/or the second type of particles have a diameter of from greater

than 100 nm to 20 microns, preferably from 600 nm to 1 micron.

8. The sintering powder of claim 6 or claim 7, wherein the particulate comprises from 81 to 99 wt% of the first type of particles and from 1 to 19 wt% of the second type of particles, preferably from 85 to 95 wt% of the first type of particles and 5 to 15 wt% of the second type of particles.

9. The sintering powder of any of claims 1 - 5, wherein the particulate has a mean longest diameter of from 1 to 100 nm, preferably from 5 to 75 nm.

10. The sintering powder of any of claims 1 - 5, wherein the particulate has a mean longest diameter of from 100 nm to 10 microns, preferably from 600 nm to 1 micron.

11. A sintered joint formed using the sintering powder of any preceding claim.

12. A sintering paste comprising:
the sintering powder of any of claims 1 - 10;
a binder;
a solvent; and
optionally an activator and/or rheology modifier and/or surfactant.

13. The sintering paste of claim 10 wherein the binder comprises an epoxy-based resin.

14. The sintering paste of claim 12 or claim 13 wherein the solvent comprises a monoterpene alcohol and/or a glycol

and/or glycol ether, preferably a terpineol and/or triethylene glycol.

15. The sintering paste of any of claims 12 - 14 comprising:

from 1 to 15 wt% binder; and/or

from 1 to 15 wt% solvent; and/or

up to 1 wt% rheology modifier; and/or

up to 1 wt% activator; and/or

up to 6 wt% surfactant.

16. A sintering paste comprising:

the sintering powder of any of claims 1 - 10;

an organosilver compound;

a solvent; and

optionally an activator and/or rheology modifier and/or surfactant.

17. The sintering paste of claim 16 wherein the organosilver compound comprises one or more of silver oxalate, silver lactate, silver succinate, silver neodecanoate, silver citrate and silver stearate.

18. The sintering paste of claim 16 or claim 17 further comprising a fatty acid, preferably lauric acid, stearic acid and/or citric acid.

19. The sintering paste of any of claims 16-18 further comprising a peroxide, preferably hydrogen peroxide.

20. The sintering paste of any of claims 16-19 wherein the paste is substantially resin free.

21. The sintering paste of any of claims 16 - 20, wherein the paste is pin transferable and/or exhibits a thermal conductivity of greater than 200 W/mK and/or is capable of providing a die shear strength of from 25 to 45 MPa.

22. A sintering film comprising the sintering powder of any of claims 1 - 10 and a binder.

23. Use of the sintering powder of any of claims 1 - 10 or the sintering paste of any of claims 12 - 21 or the sintering film of claim 22 in a method selected from: die attachment, wafer-to-wafer bonding, reflective layer printing, hermetic and near hermetic sealing, sintering films comprising a sintering powder and a binder formed in a film on a backing layer, dispensing and the production of interconnect lines.

24. A method of manufacturing a sintered joint comprising the steps:

providing the sintering powder of any of claims 1 - 10 or the sintering paste of any of claims 12 - 21 or the sintering film of claim 22 in the vicinity of two or more work pieces to be joined; and

heating the sintering powder or sintering paste or sintering film to at least partially sinter the metal.

25. The method of claim 24 wherein the heating is carried out at a temperature of at least 140 °C, preferably from 150 °C to 300 °C.

26. A method of manufacturing the sintering powder of any preceding claim comprising the steps:

providing a metal salt solution;

contacting the metal salt solution with a capping agent; and

precipitating metal particles at least partially coated with the capping agent.

27. The method of claim 26 wherein the precipitating step is carried out using a reducing agent.

28. The method of claim 27 wherein the reducing agent comprises hydrazine and/or sodium borohydride.

Claims:

1. A sintering powder comprising:

a particulate having a mean longest diameter of less than 10 microns, wherein at least some of the particles forming the particulate comprise a metal at least partially coated with a capping agent, wherein the particulate comprises a first type of particles having a longest diameter of from 1 to 100 nm and a second type of particles having a longest diameter of from greater than 100 nm to 50 microns, wherein the particulate comprises from 85 to 95 wt.% of the first type of particles and from 5 to 15 wt.% of the second type of particles.

2. The sintering powder of claim 1 wherein the capping agent comprises an amine and/or a carboxylate functional group.

3. The sintering powder of claim 1 or claim 2 wherein the capping agent comprises a straight chain or branched chain aliphatic amine, preferably octylamine.

4. The sintering powder of any preceding claim wherein the metal comprises silver or an alloy thereof.

5. The sintering powder of any preceding claim comprising up to 5 wt% capping agent, preferably from 0.1 to 3 wt% capping agent, more preferably about 1 wt% capping agent.

6. The sintering powder of any preceding claim, wherein the first type of particles have a longest diameter of from 5 to 75 nm and/or the second type of particles have a longest diameter of from greater than 100 nm to 20 microns, preferably from 600 nm to 1 micron.

7. The sintering powder of any of claims 1 - 5, wherein the particulate has a mean longest diameter of from 1 to 100 nm, preferably from 5 to 75 nm.

8. The sintering powder of any of claims 1 - 5, wherein the particulate has a mean longest diameter of from 100 nm to 10 microns, preferably from 600 nm to 1 micron.

9. A sintered joint formed using the sintering powder of any preceding claim.

10. A sintering paste comprising:
the sintering powder of any of claims 1 - 8;
a binder;
a solvent; and
optionally an activator and/or rheology modifier and/or surfactant.

11. The sintering paste of claim 10 wherein the binder comprises an epoxy-based resin.

12. The sintering paste of claim 10 or claim 11 wherein the solvent comprises a monoterpene alcohol and/or a glycol and/or glycol ether, preferably a terpineol and/or triethylene glycol.

13. The sintering paste of any of claims 10 - 12 comprising:
from 1 to 15 wt% binder; and/or
from 1 to 15 wt% solvent; and/or
up to 1 wt% rheology modifier; and/or
up to 1 wt% activator; and/or
up to 6 wt% surfactant.

14. A sintering paste comprising:

the sintering powder of any of claims 1 - 8;

an organosilver compound;

a solvent; and

optionally an activator and/or rheology modifier and/or surfactant.

15. The sintering paste of claim 14 wherein the organosilver compound comprises one or more of silver oxalate, silver lactate, silver succinate, silver neodecanoate, silver citrate and silver stearate.

16. The sintering paste of claim 14 or claim 15 further comprising a fatty acid, preferably lauric acid, stearic acid and/or citric acid.

17. The sintering paste of any of claims 14-16 further comprising a peroxide, preferably hydrogen peroxide.

18. The sintering paste of any of claims 14-17 wherein the paste is substantially resin free.

19. The sintering paste of any of claims 14-18, wherein the paste is pin transferable and/or exhibits a thermal conductivity of greater than 200 W/mK and/or is capable of providing a die shear strength of from 25 to 45 MPa.

20. A sintering film comprising the sintering powder of any of claims 1 - 8 and a binder.

21. Use of the sintering powder of any of claims 1 - 8 or the sintering paste of any of claims 10-19 or the sintering film of claim 20 in a method selected from: die attachment, wafer-

to-wafer bonding, reflective layer printing, hermetic and near hermetic sealing, sintering films comprising a sintering powder and a binder formed in a film on a backing layer, dispensing and the production of interconnect lines.

22. A method of manufacturing a sintered joint comprising the steps:

providing the sintering powder of any of claims 1 - 8 or the sintering paste of any of claims 10-19 or the sintering film of claim 20 in the vicinity of two or more work pieces to be joined; and

heating the sintering powder or sintering paste or sintering film to at least partially sinter the metal.

23. The method of claim 22 wherein the heating is carried out at a temperature of at least 140 °C, preferably from 150 °C to 300 °C.

24. A method of manufacturing the sintering powder of any preceding claim comprising the steps:

providing a metal salt solution;

contacting the metal salt solution with a capping agent; and

precipitating metal particles at least partially coated with the capping agent.

25. The method of claim 24 wherein the precipitating step is carried out using a reducing agent.

26. The method of claim 25 wherein the reducing agent comprises hydrazine and/or sodium borohydride.