During recent developments in the electronic industry, the chips for LED applications have became smaller and thinner, which requires that the bond line thickness of die attach paste need to be evermore thinner. This creates limits for the filler's particle size as the fillers with large particle size hinder the formation of thin bond line thickness of die attach paste. Obviously, the fillers with small particle size decrease the bond line thickness of die attach paste. However, small particle size does not necessary provide adequate heat dissipation. In general high thermal conductive fillers, such as spherical alumina particles with lower particle size cannot meet high thermal conductive requirement while larger particle size cannot meet the requirement of lower bond line thickness for die attach paste. More specifically, for example small spherical Al_2O_3 filler particles do not meet the thermal conductivity requirement for LED applications.

In addition, anti-yellowing properties have become very important feature for die attach pastes used in the LED application as die attach paste is exposed for high temperatures for a long time. Above mentioned small spherical Al_2O_3 filler particles do not have very good anti-yellowing properties either.

Therefore, it is objective of the present invention to provide a die attach paste with good heat dissipation and anti-yellowing properties in combination with capability to form thin bond line thickness.

Summary of the invention

In one aspect, the present disclosure provides a die attach paste composition comprising (a) a organosilicone resin; (b) a single crystal alumina filler wherein said single crystal alumina filler has ellipsoidal shape, and particle size from 1 μm to 5.5 μm and surface area from 1 m^2/g to 3 m^2/g; (c) a hardener; and (d) an inhibitor.

In another aspect, the present disclosure provides a use of die attach paste composition as disclosed herein to attach a die on to a surface.

Short description of the figures

Figure 1 is a scanning electron microscope (SEM) image of spherical alumina.

Figure 2 is a SEM image of single crystal alumina used in the present invention.

Claims

1. A die attach paste composition comprising

(a) a organosilicone resin;

(b) a single crystal alumina filler, wherein said single crystal alumina filler has ellipsoidal shape, and particle size from 1 μm to 5.5 μm and surface area from 1 m^2/g to 3 m^2/g;

(c) a hardener; and

(d) an inhibitor.

2. A die attach paste composition according to claim 1, wherein said organosilicone resin is a mixture of organosilicone resin comprising vinyl functional groups and organosilicone resin comprising hydride functional groups.

3. A die attach paste composition according to claims 1 or 2, wherein said organosilicone resin has the ratio of vinyl functional groups to hydride functional groups from 1:0.2 to 1:10, more preferably from 1:0,5 to 1:5 and most preferably from 1:2 to 1:2.5.

4. A die attach paste composition according to any of claims 1 to 3, wherein said paste composition comprises organosilicone resin from 15% to 40% by weight of total paste composition, preferably from 17% to 37%, more preferably from 22% to 32%.

5. A die attach paste composition according to any of the claims 1 to 4, wherein said single crystal alumina filler has particle size from 2 μm to 5 μm.

6. A die attach paste composition according to any of claims 1 to 5, wherein said paste composition comprises single crystal alumina filler from 55% to 80% by weight of total paste composition, preferably from 60% to 80%, more preferably from 65% to 75%, even more preferably from 65% to 70%.

7. A die attach paste composition according to any of the claims 1 to 6, wherein said single crystal alumina filler has specific surface area of from 2 m^2/g to 2.5 m^2/g.

8. A die attach paste composition according to any of the claims 1 to 7, wherein said hardener is Pt containing hardener.

9. A die attach paste composition according to any of claims 1 to 8, wherein said paste composition comprises hardener from 0.05% to 1.05% by weight of organosilicone resin, preferably from 0.1% to 1.0%, more preferably from 0.2% to 0.5%.

10. A die attach paste composition according to any of claims 1 to 9, wherein said inhibitor is selected from the group consisting of 1-ethynyl-1-cyclohexanol, 3,5-dimethyl-1-hexyn-3-ol, 2-phenyl-3-butyn-2-ol, 1,3,5,7-tetramethyl-1,3,5,7-tetravinyl-cyclotetrasiloxane (MVC) and combination of 2-phenyl-3-butyn-2-ol, 1,3,5,7-tetramethyl-1,3,5,7-tetravinyl-cyclotetrasiloxane.

11. A die attach paste composition according to any of claims 1 to 10, wherein said paste composition comprises inhibitor from 0.01 % to 10 % by weight of total paste composition, preferably from 0.5 % to 5 % and more preferably from 1 % to 3 %.

12. A die attach paste composition according to any of the claims 1 to 11, wherein said paste composition further comprises additives selected from the group consisting of adhesion promoter, solvent, silylcoupling agent, anti-bleed agent and optical brightening agents.

13. Use of die attach paste according to any of the claims 1 to 12 to attach a die on to a substrate.