[0046]

In view of obtaining bonding films exhibiting high level shape retention and forming a bonded structure exhibiting the thermal conductivity and electrical conduction reliability in a stable manner, the thickness of the formed coating films immediately after application is preferably 1 μm or more and 1000 μm or less, and more preferably 5 μm or more and 700 μm or less.

[0047]

In the case where the bonding composition contains a liquid medium, the amount of the liquid medium in the bonding composition is preferably 40 parts by mass or less, and more preferably 35 parts by mass or less, relative to 100 parts by mass of the copper particles, in view of imparting an appropriate viscosity to the bonding composition and enhancing the shape retention of the coating films when the bonding composition is applied to the copper foil. The amount of the liquid medium in the bonding composition is preferably 10 parts by mass or more.

[0048]

In view of enhancing ease of application of the coating on the copper foil and the shape retention of the coating films, the viscosity of the bonding composition is preferably 20 Pa•s or more and 200 Pa•s or less, and more preferably 25 Pa•s or more and 180 Pa•s or less, as measured at a shear rate of 10 s^{-1} and a temperature of 25°C without any thermal history. The viscosity of the bonding composition can be measured using a rheometer (apparatus for measuring the viscoelasticity) with a parallel plate sensor.

[0049]

The bonding composition may contain additional components as long as the advantageous effects of the present invention are exhibited. Examples of the additional components include a binder component, a surface tension modifier, an anti-foaming agent, and a viscosity modifier. The total amount of the additional components is

power module structure may be configured such that a plurality of bonded structures 10 are electrically connected to electrodes of a lead frame or the like via metal wire made of gold, copper, or the like. One or more metal wires are provided on the bonded object (bonding target 5), such as a semiconductor element or a substrate having a metal such as copper on a surface thereof, so as to electrically connect the bonded structures 10 and the electrodes.

[0072]

An example of a power module structure will be described with reference to Fig. 2(b). A semiconductor element is used as the first bonding target (first bonded object) 51, a heat dissipation plate made of a metal such as copper is used as the second bonding target (second bonded object) 52, and a DBC substrate is used as the third bonding target (third bonded object) 53. In the resulting bonded structure 10, a composite bonding layer 1L, which is a sintered product of a bonding sheet 1, may be present between the two bonded objects 51 and 53 and/or between the two bonded objects 52 and 53.

[0073]

The present invention has been described above based on preferred embodiments thereof, but the present invention is not limited to the embodiments given above. For example, in the bonded structure 10 obtained by heating the stack 10A according to the embodiment shown in Fig. 2(b), a composite bonding layer 1L is present between the bonded objects 51 and 53 and also another composite bonding layer 1L is present between the bonded objects 52 and 53. However, the present invention is not limited to this configuration. Specifically, for example, only a bonding layer 30 may be present between the bonded objects 52 and 53 while a composite bonding layer 1L is present between the bonded objects 51 and 53. Alternatively, only a bonding layer 30 may be present between the bonded objects 51 and 53 while a composite bonding layer 1L is present between the bonded objects 52 and 53.