COMPOSITE ALLOY BONDING WIRE

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ABSTRACT

A manufacturing method for a composite alloy bonding wire and products thereof are provided. A primary material of Ag is melted in a vacuum melting furnace, and then a secondary metal material of Pd is added into the vacuum melting furnace and is co-melted with the primary material to obtain an Ag—Pd alloy solution. The obtained Ag—Pd alloy solution is drawn to obtain an Ag—Pd alloy wire. The Ag—Pd alloy wire is then drawn to obtain an Ag—Pd alloy bonding wire with a predetermined diameter.
provide metal materials

melt the metal materials to obtain an alloy solution

draw the alloy solution to obtain an alloy bonding metal wire

clean the alloy bonding wire

anneal the alloy bonding wire

FIG. 1
Provide metal materials

Add metal materials into a vacuum melting furnace

Co-melt the metal materials in the vacuum melting furnace

Obtain an alloy solution

Draw to obtain an alloy wire

Rewire the alloy wire

Analysis the composition of the alloy wire

Draw by a first thick drawing machine

Draw by a second thick drawing machine

Draw by a first thin drawing machine

Draw by a second thin drawing machine

Draw by a very thin drawing machine

Draw by an ultra thin drawing machine

Clean the alloy bonding wire

Anneal the alloy bonding wire

FIG. 2
FIG. 3

FIG. 4

FIG. 5 (Prior Art)
COMPOSITE ALLOY BONDING WIRE
RELATED APPLICATIONS

[0001] This application is a continuation-in-part (CIP) application of U.S. patent application Ser. No. 13/334,047, filed on Dec. 21, 2011.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention
[0003] The present invention generally relates to a bonding wire used as a packaging wire, in particular, to a bonding wire used in the semiconductor packaging process.
[0004] 2. Description of Related Art
[0005] In semiconductor device packaging processes for IC, LED, SAW, a wire bonding process is often performed to electrically connect the chip to the substrate by a bonding wire which is used as a signal and electrical current transmitting medium between the chip and the substrate.
[0006] The primary characteristics of the bonding wire, such as the breaking load, elongation, loop melting point, and bondability with IC chips depend on the materials of the bonding wire. The performance of the packaged semiconductor device is influenced by the characteristics of the bonding wire. According to different types of chip and substrate, the adapted bonding wire has different specifications.
[0007] The conventional bonding wires are usually made of pure Au material. Pure Au bonding wire has better physical properties, such as elongation and electrical conductivity. However, pure Au bonding wire inevitably leads to a high cost.
[0008] Therefore, the subject of the present invention is to solve the above mentioned problem to provide a low cost bonding wire with performance comparable to pure Au bonding wire.
[0009] German patent no. DE 3122996 “Silver-palladium-magnesium-aluminum alloy for internally oxidized electrical contacts, e.g. spring contacts” is related to an alloy used for electrical breaker and sliding contacts, e.g. in relays, switches and potentiometers. The alloy has the composition (by wt.) of 5-30% Pd, 0.1-0.5% Mg, 0.01-0.5% Al and balance Ag, which is not suitable for making as a bonding wire used for IC, LED, SAW because of following reasons.
[0010] 1. When wt. % of Pd is more than 10%, the hardness of the wire will be larger than 150-200 kp/mm². In comparison, the hardness of the bonding wire is normal 60-90 kp/mm². That is, the wire made by the alloy of DE 3122996 may not be drawn to have a diameter as or less than 0.0175 mm (0.7 mil), and a soldering process may not be performed because it may cause cracking or catering to the IC or LED due to the hardness of the wire.
[0011] 2. Adding Mg will increase the wear resistance and hardness of the alloy. After adding Mg, an oxidation process may have to be performed to obtain MgO particles in the alloy. However, MgO will make the alloy become hard and brittle to be used as a bonding wire for IC and LED. Besides, MgO will increase the resistance of the alloy and decrease the conductivity of the alloy. That is also not good for the alloy to be as a bonding wire.
[0012] 3. Adding Al will decrease the elongation of the alloy and increase the resistance of the alloy. In addition, adding Al in Ag will produce various configurations of Ag and Al compound in the alloy. These are negative for the alloy to be as the bonding wire.

[0013] 4. The resistance of the alloy of DE 3122996 is about 0.08-0.16 ohm, mm²/m which is 160-170 times of 0.00023-0.00050 ohm, mm²/m for a general resistance of a bonding wire. The higher the resistance of the bonding wire is, the lower the conductivity will be. The bonding wire with high resistance will reduce the transmission speed and the lifespan of the IC or LED.

[0014] In addition, Ag-based alloy wire such as Ag—Pd alloy wire for a semiconductor package has disclosed in related art for example Japanese patent application publication no. JP200025120 and US patent application publication nos. US 2008/249975 and US 2008/269015. However, as manufacturing process of Ag—Pd alloy wire is different, the structure of Ag—Pd alloy wire may be different. The Ag—Pd alloy wire with different structure would have different properties such as tensile strength, toughness, elongation, hardness, electrical conductivity, thermal conductivity, anti-oxidation, corrosion resistance and higher electro-migration resistance.

[0015] Annealing, in metallurgy and materials science, is a heat treatment wherein a material is altered, causing changes in its properties such as hardness and elongation. It is a process that produces conditions by heating to above the critical temperature, maintaining a suitable temperature, and then cooling. Annealing is used to induce elongation, soften material, relieve internal stresses, refine the structure by making it homogeneous, and improve cold working properties. Therefore, annealing process is important for ensuring a final product with desirable physical properties.

SUMMARY OF THE INVENTION

[0016] The present invention is to provide a low cost composite alloy bonding wire made of silver and Palladium, capable of having performance as good as a pure Au bonding wire.

[0017] Accordingly, a manufacturing method for a composite alloy bonding wire is disclosed. A primary metal material of Ag is melted in a vacuum melting furnace, and then a secondary metal material of Pd is added into the vacuum melting furnace and is co-melted with the primary metal material of Ag to obtain an Ag—Pd alloy solution. The obtained Ag—Pd alloy solution is then cast and drawn to obtain an Ag—Pd alloy wire. Finally, the obtained Ag—Pd alloy wire is then drawn to obtain an Ag—Pd alloy bonding wire with a predetermined diameter. An amount of cold working in the final drawing is between 2% to 10%.

[0018] Besides, a composite alloy bonding wire made by the abovementioned manufacturing method is provided. The composite alloy bonding wire includes 90.00-99.99 wt. % Ag and 0.01-10.00 wt. % but no more than 10.00 wt. % Pd, besides unavoidable impurities. The composite alloy bonding wire has thinner strands and annealing twins and the amount of the annealing twins to all grains is above 20%.

[0019] The composite alloy bonding wire made of silver and palladium has performance as good as a pure Au bonding wire and a lower manufacturing cost.

BRIEF DESCRIPTION OF DRAWING

[0020] The features of the invention believed to be novel are set forth with particularity in the appended claims. The invention itself, however, may be best understood by reference to the following detailed description of the invention, which
describes an exemplary embodiment of the invention, taken in conjunction with the accompanying drawings, in which:

[0021] FIG. 1 is a flow chart for manufacturing composite alloy bonding wire of the present invention; and

[0022] FIG. 2 shows detailed sub-steps in the flow chart of FIG. 1.

[0023] FIG. 3 schematically shows a longitudinal sectional view of slender grains and annealing twins in the structure of composite alloy bonding wire of the present invention.

[0024] FIG. 4 shows a photograph of slender grains and annealing twins in the structure of composite alloy bonding wire of the present invention.

[0025] FIG. 5 shows a photograph of the structure of composite alloy bonding wire made by a conventional method.

DETAILED DESCRIPTION OF THE INVENTION

[0026] In cooperation with attached drawings, the technical contents and detailed description of the present invention are described hereinafter according to a preferable embodiment, being not used to limit its executing scope. Any equivalent variation and modification made according to appended claims is all covered by the claims claimed by the present invention.

[0027] Pure Ag has good characteristics as compared to Au or Cu (See below Table 1). However, Ag could not be used as a bonding wire as Au or Cu because during the process of ball bonding, an interfacial reaction will occur between Ag and Al which is in the Al pad formed on a chip to produce the intermetallic compounds such as Ag₅Al and Ag₂Al₄ which have the hard and brittle characteristics. Meanwhile, the difference between the diffusion rates of Ag and Al is so significant, kirkendall voids will be created. As a result, high electrical resistance or open circuits, weak bond adherence or brittle bond heels will be created. The whole integrated circuit should lose its function.

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Gold</th>
<th>Silver</th>
<th>Copper</th>
<th>Palladium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomic Symbol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atomic Number</td>
<td></td>
<td>79</td>
<td>47</td>
<td>29</td>
<td>46</td>
</tr>
<tr>
<td>Melting Point °C</td>
<td></td>
<td>1064.4</td>
<td>951.9</td>
<td>1083</td>
<td>1554</td>
</tr>
<tr>
<td>Boiling Point °C</td>
<td></td>
<td>3080</td>
<td>2212</td>
<td>2567</td>
<td>3140</td>
</tr>
<tr>
<td>Density, 20°C g/cm³</td>
<td></td>
<td>19.3</td>
<td>10.5</td>
<td>8.96</td>
<td>12.0</td>
</tr>
<tr>
<td>Resistivity, 20°C μΩm</td>
<td></td>
<td>2.3</td>
<td>1.63</td>
<td>1.69</td>
<td>10.8</td>
</tr>
<tr>
<td>Thermal Conductivity W/mK</td>
<td></td>
<td>316</td>
<td>429</td>
<td>401</td>
<td>71.8</td>
</tr>
<tr>
<td>Specific Heat J/Kg K</td>
<td></td>
<td>130</td>
<td>234</td>
<td>386</td>
<td>244</td>
</tr>
<tr>
<td>Hardness Molar Mohs</td>
<td></td>
<td>2.5</td>
<td>2.5</td>
<td>3.0</td>
<td>4.75</td>
</tr>
<tr>
<td>Hardness Vickers</td>
<td>MN/m²</td>
<td>215</td>
<td>215</td>
<td>369</td>
<td>461</td>
</tr>
</tbody>
</table>

[0028] Nevertheless, Ag should be used as a base metal because of its density, hardness, electrical conductivity, thermal conductivity and the cost. The density of Ag is 10.5 g/cm³, while in is 54.4% of Au. It is light enough to meet the weight requirement of the electronic products. In addition, comparing the hardness of Ag, Au, Cu and Pd, the order is Pd, Cu, Ag and Au from high hardness to low hardness. Under either Mohs or Vickers hardness examination, the harness of Ag is the closest to that of Au. The hardness is critical to IC, LED and SAW because if the material of packaging wire is too hard, it is easy to break or go through the IC chips and destroy the IC, LED and SAW package.

[0029] Comparing the electrical resistance of Ag, Au, Cu and Pd, the order is Pd, Au, Cu, Ag from high resistance to low resistance. Ag has the lowest resistance and has the best conductivity. Therefore, the alloy using Ag as a base metal is a good conductor, which is important to IC, LED and SAW.

[0030] Comparing the thermal conductivity of Ag, Au, Cu and Pd, the order is Ag, Cu, Au and Pd from high to low. Thermal conductivity of Ag is the biggest and it means Ag has the best cooling capacity, which is important to IC, LED and SAW.

[0031] Ag with the purity higher than 99.99% is easy to be broken because its hardness is low during the wire drawing process. As a result, during wire bonding process, partial wire arc may collapse because of the soft material, which may cause short circuit between the wire and cause IC, LED and SAW unable to use.

[0032] If pure Pd is used to be the base of the packaging wire, it is not practical because of the hardness, electrical resistance and high cost. Therefore, when Ag is used as the basic material for the alloy, other elements must be added to change the property of Ag. In the present application, the alloy includes Pd and excludes Mg and Al. The advantages of adding Pd are (1) to increase the oxidation resistant effect; (2) to increase the oxidation resistance; (3) to decrease the diffusion rate between Ag and Al, thus to avoid the cracking of the intermetallic compounds and the creation of kirkendall voiding.

[0033] Refer to FIG. 1 and FIG. 2, which respectively are a flow chart for manufacturing composite alloy bonding wire of the present invention and a drawing showing detailed sub-steps in the flow chart of FIG. 1.

[0034] Step 100, a primary material of Ag is provided.

[0035] Step 102, the primary material is melted in a vacuum melting furnace (step 102a). Specific amount of a secondary metal material of Pd is added into the vacuum melting furnace (step 102b), and co-melted with the primary material in the vacuum melting furnace to obtain an Ag—Pd alloy solution (step 102c). The Ag—Pd alloy solution consists of 90.00—99.99 wt % Ag and 0.01—10.00 wt% but no more than 10.00 wt% Pd, besides unavoidable impurities.

[0036] Subsequently, continuous casting and drawing processes are performed on the Ag—Pd alloy solution to obtain an Ag—Pd alloy wire with a diameter of 4-8 mm (step 102d). The Ag—Pd alloy wire is rewired by a reeling machine (step 102e) and then composition analysis (102f) is performed on the Ag—Pd alloy wire to check if the obtained composition meets the requirement.

[0037] Step 104, a drawing process is performed on the Ag—Pd alloy wire; the obtained Ag—Pd alloy wire with a diameter of 4-8 mm is drawn by a first thick drawing machine to obtain an Ag—Pd alloy wire with a diameter of 3 mm or smaller than 3 mm (step 104a). The Ag—Pd alloy wire with a diameter of 3 mm or smaller than 3 mm is drawn by a second thick drawing machine to obtain an Ag—Pd alloy wire with a predetermined diameter of 1 mm or smaller than 1 mm (step 104b). The Ag—Pd alloy wire with diameter 1 mm or smaller than 1 mm is drawn by a first thin drawing machine to obtain an Ag—Pd alloy wire with a diameter of 0.5 mm or smaller than 0.5 mm (step 104c). Then the Ag—Pd alloy wire with a diameter of 0.5 mm or smaller than 0.5 mm is sequentially drawn by the second thin drawing machine (step 104d), a very thin drawing machine (step 104e) and an ultra thin drawing machine (step 104f) to obtain an ultra thin Ag—Pd alloy bonding wire with a predetermined diameter of 0.0008 mm.
An amount of cold working in step 104f is between 2% to 10%.

Step 106, the surface of the Ag—Pd alloy bonding wire is cleaned.

Step 108, the Ag—Pd alloy bonding wire is annealed to ensure a final product with desirable physical properties of breaking load and elongation. The Ag—Pd alloy bonding wire is annealed from 1200° C. to 25° C. for 0.3 to 5 seconds.

FIG. 3 schematically shows a longitudinal sectional view of slender grains and annealing twins in the structure of composite alloy bonding wire of the present invention. As shown in FIG. 3, the slender grains 18 are adjacent to a central site of the composite alloy bonding wire 10. Reference numerals 12, 14 and 16 respectively represent coxial grains, high angle crystal boundary and annealing twins.

FIG. 4 shows a photograph of slender grains and annealing twins in the structure of composite alloy bonding wire of the present invention. FIG. 5 shows a photograph of the structure of composite alloy bonding wire made by a conventional method. Referring to FIG. 4, in case of the present invention, composite alloy bonding wire 10 has slender grains 18 and annealing twins 16 and the amount of the annealing twins 16 to all grains is above 20%. Referring to FIG. 5, in case of the conventional method, composite alloy bonding wire 20 has none of slender grains and annealing twins.

The Ag—Pd alloy bonding wire can be applied to packaging process of IC, LED and SAW because the hardness of the bonding wire is within the range of 60-90 kp/mm², and the resistance of the bonding wire is within the range of 0.00023-0.00050 ohm, mm²/m.

The invention is more detailed described by three embodiments below:

Embodiment 1

A primary material of Ag is provided and is melted in a vacuum melting furnace. Then, specific amount of a secondary metal material of Pd is added into the vacuum melting furnace, and is co-melted with the primary material in the vacuum melting furnace to obtain an Ag—Pd alloy solution. The Ag—Pd alloy solution consists of: 99.99 wt. % Ag and 0.001 wt. % Pd, besides unavoidable impurities. The composite alloy bonding wire has slender grains and annealing twins and the amount of the annealing twins to all grains is above 20%.

Continuous casting and drawing processes are performed on the Ag—Pd alloy solution to obtain an Ag—Pd alloy wire with a diameter of 4 mm. The Ag—Pd alloy wire is rewired by a reeling machine and then composition analysis is performed on the Ag—Pd alloy wire to check if the obtained composition meets the requirement.

A drawing process is performed on the Ag—Pd alloy wire; the obtained Ag—Pd alloy wire with a diameter of 4 mm is drawn by a first thick drawing machine to obtain an Ag—Pd alloy wire with a diameter of 3 mm. The Ag—Pd alloy wire with a diameter of 3 mm is drawn by a second thick drawing machine to obtain an Ag—Pd alloy wire with a diameter of 1 mm. The Ag—Pd alloy wire with a diameter of 1 mm is drawn by a first thin drawing machine to obtain an Ag—Pd alloy wire with a diameter of 0.18 mm. Then the Ag—Pd alloy wire with a diameter of 0.18 mm is sequentially drawn by the second thin drawing machine, a very thin drawing machine and an ultra thin drawing machine to obtain an ultra thin Ag—Pd alloy bonding wire with a predetermined diameter of 0.050 mm to 0.010 mm. An amount of cold working in the final drawing is between 2% to 10%.

Finally, the surface of Ag—Pd alloy bonding wire is cleaned and is annealed. The Ag—Pd alloy bonding wire is annealed from 1200° C. to 25° C. for 0.3 to 5 seconds. Under the above conditions, most of the grains inside contain annealing twin boundary with low energies that is stable than the conventional high angle grain boundary of grains in a wire.

Embodiment 2

A primary material of Ag is provided and is melted in a vacuum melting furnace. Then, specific amount of a secondary metal material of Pd is added into the vacuum melting furnace, and is co-melted with the primary material in the vacuum melting furnace to obtain an Ag—Pd alloy solution. The Ag—Pd alloy solution consists of: 95.00 wt. % Ag and 5.00 wt. % Pd, besides unavoidable impurities. The composite alloy bonding wire has slender grains and annealing twins and the amount of the annealing twins to all grains is above 20%.

Continuous casting and drawing processes are performed on the Ag—Pd alloy solution to obtain an Ag—Pd alloy wire with a diameter of 6 mm. The Ag—Pd alloy wire is rewired by a reeling machine and then composition analysis is performed on the Ag—Pd alloy wire to check if the obtained composition meets the requirement.

A drawing process is performed on the Ag—Pd alloy wire; the obtained Ag—Pd alloy wire with a diameter of 6 mm is drawn by a first thick drawing machine to obtain an Ag—Pd alloy wire with a diameter of 3 mm. The Ag—Pd alloy wire with a diameter of 3 mm is drawn by a second thick drawing machine to obtain an Ag—Pd alloy wire with a diameter of 1.0 mm. The Ag—Pd alloy wire with a diameter of 1.0 mm is drawn by a first thin drawing machine to obtain an Ag—Pd alloy wire with a diameter of 0.18 mm. Then the Ag—Pd alloy wire with a diameter of 0.18 mm is sequentially drawn by the second thin drawing machine, a very thin drawing machine and an ultra thin drawing machine to obtain an ultra thin Ag—Pd alloy bonding wire with a predetermined diameter of 0.050 mm to 0.010 mm. An amount of cold working in the final drawing is between 2% to 10%.

Finally, the surface of Ag—Pd alloy bonding wire is cleaned and is annealed. The Ag—Pd alloy bonding wire is annealed from 1200° C. to 25° C. for 0.3 to 5 seconds.

Embodiment 3

A primary material of Ag is provided and is melted in a vacuum melting furnace. Then, specific amount of a secondary metal material of Pd is added into the vacuum melting furnace, and is co-melted with the primary material in the vacuum melting furnace to obtain an Ag—Pd alloy solution. The Ag—Pd alloy solution consists of: 90.00 wt. % Ag and 10.00 wt. % Pd, besides unavoidable impurities. The composite alloy bonding wire has slender grains and annealing twins and the amount of the annealing twins to all grains is above 20%.

Continuous casting and drawing processes are performed on the Ag—Pd alloy solution to obtain an Ag—Pd alloy wire with a diameter of 8 mm. The Ag—Pd alloy wire is rewired by a reeling machine and then composition analysis is performed on the Ag—Pd alloy wire to check if the obtained composition meets the requirement.
performed on the Ag—Pd alloy wire to check if the obtained composition meets the requirement.

[0054] A drawing process is performed on the Ag—Pd alloy wire; the obtained Ag—Pd alloy wire with a diameter of 8 mm is drawn by a first thick drawing machine to obtain an Ag—Pd alloy wire with a diameter of 2 mm. The Ag—Pd alloy wire with a diameter of 2 mm is drawn by a second thick drawing machine to obtain an Ag—Pd alloy wire with a diameter of 1.0 mm. The Ag—Pd alloy wire with a diameter of 1.0 mm is drawn by a first thin drawing machine to obtain an Ag—Pd alloy wire with a diameter of 0.18 mm. Then the Ag—Pd alloy wire with a diameter of 0.18 mm is sequentially drawn by the second thin drawing machine, a very thin drawing machine and an ultra thin drawing machine to obtain an ultra thin Ag—Pd alloy bonding wire with a predetermined diameter of 0.050 mm to 0.010 mm. An amount of cold working in the final drawing is between 2% and 10%.

[0055] Finally, the surface of Ag—Pd alloy bonding wire is cleaned and is annealed. The Ag—Pd alloy bonding wire is annealed from 1200°C to 25°C, for 0.3 to 5 seconds.

[0056] More examples showing the characteristics for the Ag—Pd alloy bonding wire with the diameter of 1.0 mil of the present are listed as below Table 2.

<table>
<thead>
<tr>
<th>TABLE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Ag (Wt %)</td>
</tr>
<tr>
<td>Pd (Wt %)</td>
</tr>
<tr>
<td>1.0-0.18 mm</td>
</tr>
<tr>
<td>0.18-0.05 mm</td>
</tr>
<tr>
<td>0.05-0.038 mm</td>
</tr>
<tr>
<td>0.03-0.038 mm</td>
</tr>
<tr>
<td>Resistivity (μΩcm)</td>
</tr>
<tr>
<td>Electro-migration resistance (input de 0.3 A)</td>
</tr>
<tr>
<td>Temperature cycle test (TCT)</td>
</tr>
<tr>
<td>Highly accelerated stress test (HAST)</td>
</tr>
</tbody>
</table>

[0057] Specifically, the Type-6 bondability and reliability test report is attached for reference.

[0058] Due to slender grains and annealing twins existing in the Ag—Pd alloy bonding wire according to the present invention, it has higher tensile strength, toughness and elongation, lower hardness, preferred electrical conductivity, thermal conductivity, anti-oxidation and corrosion resistance and higher electro-migration resistance, especially having an advantage that a hot zone is not caused when a wire bonding process is performed.

[0059] The properties of the Ag—Pd alloy bonding wire (Ag 96 wt % and Pd 4 wt %) according to the present invention are compared to the Ag—Pd alloy bonding wire (Ag 96 wt % and Pd 4 wt %) made by a conventional method shown as Table 3.

<table>
<thead>
<tr>
<th>TABLE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>Grains</td>
</tr>
<tr>
<td>Breaking Load (gf)</td>
</tr>
<tr>
<td>Elongation (%)</td>
</tr>
<tr>
<td>Elastic Modulus (GPa)</td>
</tr>
<tr>
<td>Resistivity (μΩcm)</td>
</tr>
<tr>
<td>Hardness ( Hv )</td>
</tr>
<tr>
<td>Temperature cycle test (TCT)</td>
</tr>
<tr>
<td>Highly accelerated stress test (HAST)</td>
</tr>
</tbody>
</table>

[0060] While the invention is described in by way of examples and in terms of preferred embodiments, it is to be understood that the invention is not limited thereto. On the contrary, the aim is to cover all modifications, alternatives and equivalents falling within the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A composite alloy bonding wire, comprising: 90.00—99.99 wt. % Ag; and 0.01—10.00 wt % but not more than 10.00 wt. % Pd, besides unavoidable impurities, wherein the Ag and Pd are melted to obtain a Ag—Pd alloy that excludes Mg and Al, and Ag and Pd are essentially uniformly distributed in the alloy bonding wire, continuous casting and drawing processes are performed on the Ag—Pd alloy to obtain the alloy bonding wire used for packaging processes for IC, LED or SAW, and the composite alloy bonding wire has slender grains and annealing twins.

2. The composite alloy bonding wire according to claim 1, wherein the amount of the annealing twins to all grains is above 20%.

* * * * *