

[Document Name] ABSTRACT

[Title of Invention] WIRE STRUCTURE OF DILUTE ALLOYS OF NICKEL IN COPPER FOR BONDING SEMICONDUCTOR DEVICE

[Problem to be Solved] To improve second bondability in copper alloy bonding wire for a semiconductor device by preventing an irregularly enlarged oxide layer, which is generated directly below the wire surface layer, from growing.

[Solution] The copper alloy bonding wire is composed of a surface layer, an internal oxide layer, and a copper dilute-nickel alloy layer. The copper dilute-nickel alloy has an alloy composition in which 0.1% to 1.5% by mass of nickel (Ni) is uniformly solid-soluted in a high-purity copper (Cu) matrix having a purity of 99.995% by mass or more. The internal oxide layer, from directly below a copper oxide layer as the surface layer toward the inside, is composed of a metal deficient-type copper oxide matrix and nickel oxide particles uniformly finely dispersed in the matrix, and allows free oxygen to rapidly move and thereby allows the oxygen penetrating from the surface layer to diffuse toward the inside for preventing the copper oxide layer directly below the surface layer from growing into an irregular hemispheric film to improve the second bondability. The effect by the movement of oxygen is ensured by controlling the thickness of the internal oxide layer to be at least 60 times larger than the thickness of the oxide layer as the surface layer.

[Selected Drawing] Figure 1