CLAIMS

[Claim 1]

A structure of copper dilute-nickel alloy wire for bonding a semiconductor device, wherein the copper dilute-nickel alloy wire for bonding a semiconductor device has a reduction in area of 99% or more by continuous wire drawing and comprises a surface layer composed of a copper oxide growth layer, an internal oxide layer composed of a metal deficient-type copper oxide matrix and nickel oxide particles finely dispersed in the matrix, and an alloy layer of a copper (Cu) matrix having a purity of 99.995% by mass or more in which 0.1% to 1.5% by mass of nickel (Ni) is uniformly solid-soluted; and

the internal oxide layer has a thickness at least 60 times larger than the thickness of the surface layer, where the region in which the concentration of oxygen is reduced to one-tenth of that of the surface layer is defined as the thickness of the internal oxide layer.

[Claim 2]

A structure of copper dilute-nickel alloy wire for bonding a semiconductor device, wherein the copper dilute-nickel alloy wire for bonding a semiconductor device has a reduction in area of 99% or more by continuous wire drawing and comprises a surface layer composed of a copper oxide growth layer, an internal oxide layer composed of a metal deficient-type copper oxide matrix and nickel oxide particles finely dispersed in the matrix, and an alloy layer of a copper (Cu) matrix having a purity of 99.995% by mass or more in which 0.1% to 1.5% by mass of nickel (Ni) and 1 to 5 mass ppm of phosphorus (P) are uniformly solid-soluted; and

the internal oxide layer has a thickness at least 60 times larger than the thickness of the surface layer, where the region in which the concentration of oxygen is reduced to one-tenth of that of the surface layer is defined as the thickness of the internal oxide layer.

[Claim 3]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the internal oxide layer has a thickness at least 80 times larger than the thickness of the surface layer.

[Claim 4]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the copper dilute-nickel alloy layer includes remainder copper (Cu) having a purity of 99.998% by mass or more.

[Claim 5]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the copper dilute-nickel alloy layer includes remainder nickel (Ni) in an amount of 0.8% to 1.2% by mass.

[Claim 6]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the copper dilute-nickel alloy wire has an oxygen (O) content of 10 to 150 mass ppm.

[Claim 7]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the continuous wire drawing is performed by cold continuous wire drawing.

[Claim 8]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the bonding of a semiconductor device is performed by wedge bonding.

[Claim 9]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the bonding of a semiconductor device is performed by ball bonding and stitch bonding.

[Document Name] CLAIMS

[Claim 1]

A structure of copper dilute-nickel alloy wire for bonding a semiconductor device, wherein

the copper dilute-nickel alloy wire for bonding a semiconductor device has a reduction in area of 99% or more by continuous wire drawing and comprises a surface layer, an internal oxide layer, and a copper dilute-nickel alloy layer, wherein

the surface layer is composed of an oxide growth layer; the internal oxide layer is composed of a metal deficient-type copper oxide matrix and nickel oxide particles finely dispersed in the matrix; and the copper dilute-nickel alloy layer is composed of an alloy layer of a copper (Cu) matrix having a purity of 99.995% by mass or more in which 0.1% to 1.5% by mass of nickel (Ni) is uniformly solid-soluted; and

the internal oxide layer has a thickness at least 60 times larger than the thickness of the surface layer.

[Claim 2]

A structure of copper dilute-nickel alloy wire for bonding a semiconductor device, wherein

the copper dilute-nickel alloy wire for bonding a semiconductor device has a reduction in area of 99% or more by continuous wire drawing and comprises a surface layer, an internal oxide layer, and a copper dilute-nickel alloy layer, wherein

the surface layer is composed of an oxide growth layer; the internal oxide layer is composed of a metal deficient-type copper oxide matrix and nickel oxide particles finely dispersed in the matrix; and the copper dilute-nickel alloy layer is composed of an alloy layer of a copper (Cu) matrix having a purity of 99.995% by mass or more in which 0.1% to 1.5% by mass of nickel (Ni) and 1 to 5 mass ppm of phosphorus (P) are uniformly solid-soluted; and

the internal oxide layer has a thickness at least 60 times larger than the thickness of the surface layer.

[Claim 3]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the internal oxide layer has a thickness at least 80 times larger than the thickness of the surface layer.

[Claim 4]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the copper dilute-nickel alloy layer includes remainder copper (Cu) having a purity of 99.998% by mass or more.

[Claim 5]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the copper dilute-nickel alloy layer includes remainder nickel (Ni) in an amount of 0.8% to 1.2% by mass.

[Claim 6]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the copper dilute-nickel alloy wire has an oxygen (O) content of 10 to 150 mass ppm.

[Claim 7]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the continuous wire drawing is performed by cold continuous wire drawing.

[Claim 8]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the bonding of a semiconductor device is performed by wedge bonding.

[Claim 9]

The structure of copper dilute-nickel alloy wire for bonding a semiconductor device according to Claim 1 or 2, wherein the bonding of a semiconductor device is performed by ball bonding and stitch bonding.