CLAIMS

1. A copper alloy for an electronic device,

wherein the copper alloy is composed of a binary alloy of Cu and Mg,

the binary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic%, with a remainder being Cu and inevitable impurities, and

a conductivity σ (%IACS) is within the following range when the content of Mg is given as A atomic%,

$$\sigma \leq \{1.7241/(-0.0347\times A^2+0.6569\times A+1.7)\}\times 100.$$

2. A copper alloy for an electronic device,

wherein the copper alloy is composed of a binary alloy of Cu and Mg,

the binary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic%, with a remainder being Cu and inevitable impurities, and

an average number of intermetallic compounds having grain sizes of 0.1 μm or more is in a range of $1/\mu m^2$ or less.

3. A copper alloy for an electronic device,

wherein the copper alloy is composed of a binary alloy of Cu and Mg,

the binary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic%, with a remainder being Cu and inevitable impurities,

a conductivity σ (%IACS) is within the following range when the content of Mg is given as A atomic%, and

an average number of intermetallic compounds having grain sizes of 0.1 μm or

more is in a range of $1/\mu m^2$ or less,

$$\sigma \leq \{1.7241/(-0.0347\times A^2+0.6569\times A+1.7)\}\times 100.$$

4. The copper alloy for an electronic device according to any one of claims 1 to 3,

wherein a Young's modulus E is in a range of 125 GPa or less, and a 0.2% proof stress $\sigma_{0.2}$ is in a range of 400 MPa or more.

5. A method for producing the copper alloy for an electronic device according to any one of claims 1 to 3, the method comprising:

a heating process of heating a copper material composed of a binary alloy of Cu and Mg to a temperature of 500 to 900°C;

a rapid cooling process of cooling the heated copper material at a cooling rate of 200°C/min or more to a temperature of 200°C or lower; and

a working process of working the rapidly cooled copper material,

wherein the binary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic%, with a remainder being Cu and inevitable impurities.

6. A rolled copper alloy for an electronic device, which is composed of the copper alloy for an electronic device according to claim 4.

7. The rolled copper alloy for an electronic device according to claim 6,

wherein the rolled copper alloy is used as a copper material that constitutes a terminal, a connector, or a relay.

8. A copper alloy for an electronic device,

wherein the copper alloy is composed of a ternary alloy of Cu, Mg, and Zn,

the ternary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic% and Zn at a content in a range of 0.1 to 10 atomic%, with a remainder being Cu and inevitable impurities, and

a conductivity σ (%IACS) is within the following range when the content of Mg is given as A atomic% and the content of Zn is given as B atomic%,

$$\sigma \leq \{1.7241/(X+Y+1.7)\}\times 100$$

$$X = -0.0347\times A^2+0.6569\times A$$

$$Y = -0.0041\times B^2+0.2503\times B.$$

9. A copper alloy for an electronic device,

wherein the copper alloy is composed of a ternary alloy of Cu, Mg, and Zn,

the ternary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic% and Zn at a content in a range of 0.1 to 10 atomic%, with a remainder being Cu and inevitable impurities, and

an average number of intermetallic compounds having grain sizes of 0.1 μm or more is in a range of $1/\mu m^2$ or less.

10. A copper alloy for an electronic device,

wherein the copper alloy is composed of a ternary alloy of Cu, Mg, and Zn,

the ternary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic% and Zn at a content in a range of 0.1 to 10 atomic%, with a remainder being Cu and inevitable impurities,

a conductivity σ (%IACS) is within the following range when the content of Mg is given as A atomic% and the content of Zn is given as B atomic%, and

an average number of intermetallic compounds having grain sizes of 0.1 μm or more is in a range of $1/\mu m^2$ or less,

$$\sigma \leq \{1.7241/(X+Y+1.7)\}\times 100$$

$$X = -0.0347\times A^2+0.6569\times A$$

$$Y = -0.0041\times B^2+0.2503\times B.$$

11. The copper alloy for an electronic device according to any one of claims 8 to 10,

wherein a Young's modulus E is in a range of 125 GPa or less, and a 0.2% proof stress $\sigma_{0.2}$ is in a range of 400 MPa or more.

12. A method for producing the copper alloy for an electronic device according to any one of claims 8 to 10, the method comprising:

a heating process of heating a copper material composed of a ternary alloy of Cu, Mg, and Zn to a temperature of 500 to 900°C;

a rapid cooling process of cooling the heated copper material at a cooling rate of 200°C/min or more to a temperature of 200°C or lower; and

a working process of working the rapidly cooled copper material,

wherein the ternary alloy comprises Mg at a content in a range of 3.3 to 6.9 atomic% and Zn at a content in a range of 0.1 to 10 atomic%, with a remainder being Cu and inevitable impurities.

13. A rolled copper alloy for an electronic device, which is composed of the copper alloy

for an electronic device according to claim 11.

14. The rolled copper alloy for an electronic device according to claim 13,

wherein the rolled copper alloy is used as a copper material that constitutes a terminal, a connector, or a relay.

CLAIMS

1. A copper alloy for an electronic device,

wherein the copper alloy is composed of a binary alloy of Cu and Mg,

the binary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, and a remainder of Cu and inevitable impurities,

a conductivity σ (%IACS) is within the following range when the content of Mg is given as A atomic%, and

the copper alloy is subjected to hot working, cold working, or warm working,

$\sigma \leq \{1.7241/(-0.0347\times A^2+0.6569\times A+1.7)\}\times 100$.

2. A copper alloy for an electronic device,

wherein the copper alloy is composed of a binary alloy of Cu and Mg,

the binary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, and a remainder of Cu and inevitable impurities,

with regard to scanning electron microscope observation, an average number of intermetallic compounds having grain sizes of 0.1 μm or more is in a range of $1/\mu m^2$ or less, and

the copper alloy is subjected to hot working, cold working, or warm working.

3. A copper alloy for an electronic device,

wherein the copper alloy is composed of a binary alloy of Cu and Mg,

the binary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, and a remainder of Cu and inevitable impurities,

a conductivity σ (%IACS) is within the following range when the content of Mg is

given as A atomic%,

with regard to scanning electron microscope observation, an average number of intermetallic compounds having grain sizes of 0.1 μm or more is in a range of $1/\mu m^2$ or less, and

the copper alloy is subjected to hot working, cold working, or warm working,

$\sigma \leq \{1.7241/(-0.0347\times A^2+0.6569\times A+1.7)\}\times 100$.

4. The copper alloy for an electronic device according to any one of claims 1 to 3,

wherein a Young's modulus E is in a range of 125 GPa or less, and a 0.2% proof stress $\sigma_{0.2}$ is in a range of 400 MPa or more.

5. A method for producing the copper alloy for an electronic device according to any one of claims 1 to 4, the method comprising:

a heating process of heating a copper material composed of a binary alloy of Cu and Mg to a temperature of 500 to 900°C, wherein the binary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, and a remainder of Cu and inevitable impurities;

a rapid cooling process of cooling the heated copper material at a cooling rate of 200°C/min or more to a temperature of 200°C or lower; and

a working process of working the rapidly cooled copper material.

6. A rolled copper alloy for an electronic device, which is composed of the copper alloy for an electronic device according to any one of claims 1 to 4,

wherein the rolled copper alloy is used as a copper material that constitutes a terminal, a connector, or a relay.

7. A copper alloy for an electronic device,

wherein the copper alloy is composed of a ternary alloy of Cu, Mg, and Zn,

the ternary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, Zn at a content in a range of 0.1 to 10 atomic%, and a remainder of Cu and inevitable impurities, and

a conductivity σ (%IACS) is within the following range when the content of Mg is given as A atomic% and the content of Zn is given as B atomic%,

$$\sigma \leq \{1.7241/(X'+Y'+1.7)\}\times 100$$

$$X' = -0.0292\times A^2+0.6797\times A$$

$$Y' = -0.0038\times B^2+0.2488\times B.$$

8. A copper alloy for an electronic device,

wherein the copper alloy is composed of a ternary alloy of Cu, Mg, and Zn,

the ternary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, Zn at a content in a range of 0.1 to 10 atomic%, and a remainder of Cu and inevitable impurities, and

with regard to scanning electron microscope observation, an average number of intermetallic compounds having grain sizes of 0.1 μm or more is in a range of $1/\mu m^2$ or less.

9. A copper alloy for an electronic device,

wherein the copper alloy is composed of a ternary alloy of Cu, Mg, and Zn,

the ternary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, Zn at a content in a range of 0.1 to 10 atomic%, and a remainder of Cu and inevitable impurities,

a conductivity σ (%IACS) is within the following range when the content of Mg is given as A atomic% and the content of Zn is given as B atomic%, and

with regard to scanning electron microscope observation, an average number of intermetallic compounds having grain sizes of 0.1 μm or more is in a range of $1/\mu m^2$ or less,

$\sigma \leq \{1.7241/(X'+Y'+1.7)\}\times 100$

$X' = -0.0292\times A^2+0.6797\times A$

$Y' = -0.0038\times B^2+0.2488\times B.$

10. The copper alloy for an electronic device according to any one of claims 7 to 9,

wherein a Young's modulus E is in a range of 125 GPa or less, and a 0.2% proof stress $\sigma_{0.2}$ is in a range of 400 MPa or more.

11. A method for producing the copper alloy for an electronic device according to any one of claims 7 to 10, the method comprising:

a heating process of heating a copper material composed of a ternary alloy of Cu, Mg, and Zn to a temperature of 500 to 900°C wherein the ternary alloy consists of Mg at a content in a range of 3.3 to 6.9 atomic%, Zn at a content in a range of 0.1 to 10 atomic%, and a remainder of Cu and inevitable impurities;

a rapid cooling process of cooling the heated copper material at a cooling rate of 200°C/min or more to a temperature of 200°C or lower; and

a working process of working the rapidly cooled copper material.

12. A rolled copper alloy for an electronic device, which is composed of the copper alloy for an electronic device according to any one of claims 7 to 10,

wherein a Young's modulus E is in a range of 125 GPa or less, and a 0.2% proof stress $\sigma_{0.2}$ is in a range of 400 MPa or more.

13. The rolled copper alloy for an electronic device according to claim 12,

wherein the rolled copper alloy is used as a copper material that constitutes a terminal,

a connector, or a relay.