CLAIMS

1. A copper alloy, comprising:

Mg at a content of 3.3% by atom to 6.9% by atom, with the balance substantially being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when a Mg content is set to X% by atom, an electrical conductivity σ (%IACS) satisfies the following Expression (1),

$$\sigma \leq \{1.7241/(-0.0347\times X^2 + 0.6569\times X + 1.7)\}\times 100 \cdots (1)$$

2. A copper alloy, comprising:

Mg at a content of 3.3% by atom to 6.9% by atom, with the balance substantially being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when being observed by a scanning electron microscope, an average number of intermetallic compounds, which have grain sizes of 0.1 μm or more and which contain Cu and Mg as main components, is in a range of 1 piece/μm^2 or less.

3. A copper alloy, comprising:

Mg at a content of 3.3% by atom to 6.9% by atom, with the balance substantially being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when a Mg content is set to X% by atom, an electrical conductivity σ (%IACS) satisfies the following Expression (1), and

when being observed by a scanning electron microscope, an average number of intermetallic compounds, which have grain sizes of 0.1 μm or more and which contain Cu and Mg as main components, is in a range of 1 piece/μm^2 or less.

$$\sigma \leq \{1.7241/(-0.0347\times X^2 + 0.6569\times X + 1.7)\}\times 100 \cdots (1)$$

4. A copper alloy, comprising:

Mg at a content of 3.3% by atom to 6.9% by atom; and

at least one or more selected from a group consisting of Al, Ni, Si, Mn, Li, Ti, Fe, Co, Cr, and Zr at a total content of 0.01% by atom to 3.0% by atom,

with the balance substantially being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when being observed by a scanning electron microscope, an average number of intermetallic compounds, which have grain sizes of 0.1 μm or more and which contain Cu and Mg as main components, is in a range of 1 piece/μm^2 or less.

5. A copper alloy plastic working material which is shaped by plastically working a copper material composed of the copper alloy according to any one of claims 1 to 4.

6. The copper alloy plastic working material according to claim 5,

wherein the copper alloy plastic working material is shaped according to a manufacturing method including:

a melting and casting process of manufacturing a copper material having an alloy composition of the copper alloy according to any one of claims 1 to 4;

a heating process of heating the copper material to a temperature of 400°C to

900°C;

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

a plastic working process of plastically working the copper material which is rapidly cooled.

7. The copper alloy plastic working material according to claim 5 or 6,

wherein the copper alloy plastic working material is an elongated object having a shape selected from a bar shape, a wire shape, a pipe shape, a plate shape, a strip shape, and a band shape.

CLAIMS

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Mg at a content of 3.3% by atom to 6.9% by atom, with the balance being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when a Mg content is set to X% by atom, an electrical conductivity σ (%IACS) satisfies $\sigma \leq 1.7241/(-0.0347\times X^2 + 0.6569\times X + 1.7)\times 100$.

2. A copper alloy, comprising:

Mg at a content of 3.3% by atom to 6.9% by atom, with the balance being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when being observed by a scanning electron microscope, an average number of intermetallic compounds, which have grain sizes of 0.1 μm or more and which contain Cu and Mg as main components, is in a range of 1 piece/μm^2 or less.

3. A copper alloy, comprising:

Mg at a content of 3.3% by atom to 6.9% by atom, with the balance being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when a Mg content is set to X% by atom, an electrical conductivity σ (%IACS) satisfies $\sigma \leq 1.7241/(-0.0347\times X^2 + 0.6569\times X + 1.7)\times 100$, and

when being observed by a scanning electron microscope, an average number of intermetallic compounds, which have grain sizes of 0.1 μm or more and which contain Cu

and Mg as main components, is in a range of 1 piece/μm^2 or less.

4. A copper alloy, comprising:

Mg at a content of 3.3% by atom to 6.9% by atom; and

one or more selected from a group consisting of Al, Ni, Si, Mn, Li, Ti, Fe, Co, Cr, and Zr at a total content of 0.01% by atom to 3.0% by atom,

with the balance being Cu and unavoidable impurities,

wherein an oxygen content is in a range of 500 ppm by atom or less, and

when being observed by a scanning electron microscope, an average number of intermetallic compounds, which have grain sizes of 0.1 μm or more and which contain Cu and Mg as main components, is in a range of 1 piece/μm^2 or less.

5. The copper alloy according to any one of claims 1 to 4,

wherein the oxygen content is in a range of 50 ppm by atom or less.

6. The copper alloy according to any one of claims 1 to 5,

wherein the oxygen content is in a range of 5 ppm by atom or less.

7. A copper alloy plastic working material composed of the copper alloy according to any one of claims 1 to 6.

8. The copper alloy plastic working material according to claim 7,

wherein the copper alloy plastic working material is an elongated object having a shape selected from a bar shape, a wire shape, a pipe shape, a plate shape, a strip shape, and a band shape.

9. A method for manufacturing a copper alloy plastic working material, the method comprising:

a heating process of heating a copper material having a component composition described in any one of claims 1 to 6 to a temperature of 400°C to 900°C;

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

a plastic working process of plastically working the copper material which is rapidly cooled,

wherein a copper alloy plastic working material which has at least one of the following electrical conductivity (%IACS) and structure is manufactured,

the electrical conductivity (%IACS) which satisfies $\sigma \leq 1.7241/(-0.0347\times X^2 + 0.6569\times X + 1.7)\times 100$ when a Mg content is set to X% by atom, and

the structure in which an average number of intermetallic compounds having grain sizes of 0.1 μm or more and containing Cu and Mg as main components is in a range of 1 piece/μm^2 or less when being observed by a scanning electron microscope.