CLAIMS

[Claim 1]

A hot-rolled steel sheet comprising:

a chemical composition containing,

in mass%,

C: 0.01% to 0.30%,

Si: 0.50% or less,

Mn: 0.01% to 2.0%,

P: 0.10% or less,

S: 0.10% or less,

sol. Al: 0.10% or less, and

N: 0.015% or less,

with the balance being Fe and unavoidable impurities; and

a scale on a surface of the steel sheet,

wherein the scale in a width direction of the steel sheet has a microstructure containing,

in terms of area fraction,

magnetite grains: 30% or more,

a eutectoid transformation microstructure containing iron and magnetite: 20% or more and 60% or less,

wherein magnetite includes the magnetite grains and the magnetite contained in the eutectoid transformation microstructure, and

wustite: 20% or less, and,

in terms of mass fraction, hematite: 5% or less,

an area fraction of precipitated Fe on a surface of the scale is 15% or less, and

an average thickness of the scale in the width direction of the steel sheet is 3 μm or more and 20 μm or less.

[Claim 2]

The hot-rolled steel sheet according to Claim 1, wherein the chemical composition further contains, in mass%, at least one selected from

Cu: 1.0% or less,

Ni: 0.50% or less, and

Cr: 2.0% or less.

[Claim 3]

The hot-rolled steel sheet according to Claim 1 or 2, wherein the chemical composition further contains, in mass%, at least one selected from

Mo: 1.0% or less,

Nb: 0.1% or less,

V: 0.1% or less,

Ti: 0.03% or less,

B: 0.01% or less, and

Sb: 0.03% or less.

[Claim 4]

A method for producing a hot-rolled steel sheet, the

method comprising:

subjecting a steel material having the chemical composition according to Claim 1 or 2 to:

descaling after hot rough rolling;

finish rolling at a finish rolling delivery temperature of 800°C or higher and 950°C or lower;

cooling at an average cooling rate of 5 °C/s or higher in a temperature range from the finish rolling delivery temperature to 750°C;

then cooling at an average cooling rate of 1 °C/s or higher and 30 °C/s or lower in a range from 750°C to a temperature at start of coiling;

coiling at a coiling temperature of 450°C or higher and 600°C or lower; and

after start of coiling, cooling such that an entire coil is cooled by cooling both edge portions and sheet surface of the coil so that a temperature of an edge portion of the coil decreases at an average cooling rate of 0.5 °C/s or higher and 6.0 °C/s or lower from the coiling temperature to a cooling stop temperature of 300°C or higher and 430°C or lower.

[Claim 5]

A method for producing a hot-rolled steel sheet, the method comprising:

subjecting a steel material having the chemical

composition according to Claim 3 to:

descaling after hot rough rolling;

finish rolling at a finish rolling delivery temperature of 800°C or higher and 950°C or lower;

cooling at an average cooling rate of 5 °C/s or higher in a temperature range from the finish rolling delivery temperature to 750°C;

then cooling at an average cooling rate of 1 °C/s or higher and 30 °C/s or lower in a range from 750°C to a temperature at start of coiling;

coiling at a coiling temperature of 450°C or higher and 600°C or lower; and

after start of coiling, cooling such that an entire coil is cooled by cooling both edge portions and sheet surface of the coil so that a temperature of an edge portion of the coil decreases at an average cooling rate of 0.5 °C/s or higher and 6.0 °C/s or lower from the coiling temperature to a cooling stop temperature of 300°C or higher and 430°C or lower.