[CLAIMS]

What is claimed is:

1. A surface-treated metal sheet, comprising:

a steel sheet;

a coating layer containing zinc formed on the steel sheet; and

a conversion coating formed on the coating layer,

wherein the amount of zinc of the coating layer is 50 mass% or more,

wherein the conversion coating contains a zirconium compound, a vanadium compound, an organosilicon compound, a phosphate compound and a fluorine compound,

wherein, the average value of F/Si, which is the ratio of the solid content mass of F derived from the fluorine compound and the solid content mass of Si derived from the organosilicon compound, is 0.01 to 0.15,

wherein, the average value of Zr/Si, which is the ratio of the solid content mass of Zr derived from the zirconium compound and the solid content mass of Si derived from the organosilicon compound, is 0.06 to 0.15,

wherein, the average value of V/Si, which is the ratio of the solid content mass of V derived from the vanadium compound and the solid content mass of Si derived from the organosilicon compound, is 0.010 to 0.200,

wherein F/Si, Zr/Si and V/Si are measured as described in the description,

wherein, when the surface roughness in a rectangular area with a side of 1 μm on the surface of the conversion coating is represented by an arithmetic mean height of the scale limited surface Sa, a maximum height of the scale limited surface Sz, and a root mean square height of the scale limited surface Sq, one or more of an arithmetic mean height of the scale limited surface Sa being 0.10 to 10.0 nm, a maximum height Sz being 1.0 to 1,000 nm, and a root mean square r height of the scale limited surface Sq being 0.10 to 100 nm are satisfied,

wherein Sa, Sz and Sq are measured as described in the description.

2. The surface-treated metal sheet according to claim 1,

wherein, when the surface roughness in a rectangular area with a side of 5 μm on the surface of the conversion coating is represented by an arithmetic mean height of the scale limited surface Sa, a maximum height of the scale limited surface Sz, and a root mean square height of the scale limited surface Sq, one or more of an arithmetic mean height of the scale

limited surface Sa being 0.10 to 10.0 nm, a maximum height of the scale limited surface Sz being 1.0 to 1,000 nm, and a root mean square height of the scale limited surface Sq being 0.10 to 100 nm are satisfied.

3. The surface-treated metal sheet according to claim 1 or 2,

wherein a rectangular area with a side of 1 μm on the surface of the conversion coating contains 1 or more and 100 or less granular organosilicon compound particles having a major axis of 10 nm or more and 300 nm or less.

4. The surface-treated metal sheet according to any one of claims 1 to 3,

wherein the coating layer has an average chemical composition containing, in mass%,

Al: more than 4.0% and less than 25.0%,

Mg: more than 1.0% and less than 12.5%,

Sn: 0% to 20%,

Bi: 0% and less than 5.0%,

In: 0% and less than 2.0%,

Ca: 0% to 3.0%,

Y: 0% to 0.5%,

La: 0% and less than 0.5%,

Ce: 0% and less than 0.5%,

Si: 0% and less than 2.5%,

Cr: 0% and less than 0.25%,

Ti: 0% and less than 0.25%,

Ni: 0% and less than 0.25%,

Co: 0% and less than 0.25%,

V: 0% and less than 0.25%,

Nb: 0% and less than 0.25%,

Cu: 0% and less than 0.25%,

Mn: 0% and less than 0.25%,

Fe: 0% to 5.0%,

Sr: 0% and less than 0.5%,

Sb: 0% and less than 0.5%,

Pb: 0% and less than 0.5%, and

B: 0% and less than 0.5% with the remainder being Zn and impurities.