the workability is lowered. Therefore, the average equivalent circle diameter of the Mg-Si phase in the surface layer area is set to 15.0 μm or less.

[0029]

The average equivalent circle diameter according to the embodiment can be measured using the following method.

In a visual field of 500 × 500 μm or greater from the surface side of the plated layer (from the direction in which the plane view of the surface of the plated layer is obtained), the distribution of Si of the surface layer area of the plated layer (a range at a position at a depth of about 1 μm from the surface of the plated layer) is measured using EPMA. In the plated layer of the plated steel sheet according to the embodiment, as described later, Si is present substantially as the Mg-Si phase. Thus, the area of the phase including the measured Si is calculated, and the diameter of a circle having an area equivalent to the area thereof is equivalent to the circle diameter of the Mg-Si phase. The average equivalent circle diameter is obtained by averaging the equivalent circle diameter of the Mg-Si phase measured in the visual field.

FIGS. 2A and 2B show examples of the Si distribution measured using the method described above.

[0030]

(Distribution State of Mg-Si Phase in Plated Layer)

In the plated layer of the plated steel sheet according to the embodiment, the Mg-Si phase is distributed such that a larger number of Mg-Si phases are present on the surface side of the plated layer than on the steel sheet side when the center of the plated layer in the thickness direction is set as the reference. Thus, excellent corrosion resistance can be obtained without deteriorating the workability.

Here, as can be seen from the EPMA analysis result of the cross section of the

[DOCUMENT TYPE] CLAIMS

What is claimed is:

1. A Zn—Al—Mg-based plated steel sheet comprising:

a steel sheet;

an alloy layer which is formed on a surface of the steel sheet and contains Fe and Si; and

a plated layer which is formed on a surface of the alloy layer opposite to the steel sheet,

wherein an average composition of the plated layer and the alloy layer includes, in mass %,

Al: 45.0 to 65.0%,

Si: 0.50 to 5.00%,

Mg: 1.00 to 10.00%, and

a balance of Zn, Fe, and impurities,

the plated layer contains 0.1 to 20.0% of a Mg—Si phase in terms of volume fraction,

in a case where a 1 μm range from a surface of the plated layer in a thickness direction of the plated layer is defined as a surface layer area of the plated layer, an average equivalent circle diameter of the Mg—Si phase in the surface layer area in a direction in which the plated layer is observed in a plan view of the surface layer area is 0.1 to 15.0 μm, and

in a case where a ½ thickness position of the plated layer from the surface of the plated layer to an interface between the plated layer and the alloy layer is defined as a thickness center of the plated layer and a Si content is measured over the entire thickness of the plated layer in mass %, an integrated value of the Si content from the surface of the plated layer to the thickness center of the plated layer is 0.55 times or more of an integrated value of the Si content from the surface of the plated layer to the interface.

2. The Zn—Al—Mg-based plated steel sheet according to claim 1,

wherein the integrated value of the Si content from the surface of the plated layer to the thickness center of the plated layer is 0.60 times or more of the integrated value of the Si content from the surface of the plated layer to the interface.

3. The Zn—Al—Mg-based plated steel sheet according to claim 2,

wherein the average composition of the plated layer and the alloy layer further includes 0.01 to 1.00% in total of one or more of the group consisting of Cr, Ca, Sr, and Ni.

4. The Zn—Al—Mg-based plated steel sheet according to claim 1,

wherein the average composition of the plated layer and the alloy layer further includes 0.01 to 1.00% in total of one or more of the group consisting of Cr, Ca, Sr, and Ni.