[Claims]

[Claim 1]

A high-strength steel sheet hot-dip coated with a Zn-Al-Mg-based system and having a tensile strength of 400 MPa or greater and excellent workability, the steel sheet having a layer hot-dip coated with a Zn-Al-Mg-based system on the surface of a steel sheet material, wherein

the steel sheet material contains, in percent by mass, C: 0.005% to 0.08%, Si: 0.8% or lesser to an extent that still provides solid solution strengthening during manufacturing of the steel sheet material, Mn: 0.1% to 1.8%, P: 0.05% or less but not inclusive of 0, S: 0.02% or less but not inclusive of 0, N: 0.001% to 0.005%, Ti: 0.02% to 0.2%, B: 0.0005% to 0.01%, and Al: 0.1% or less but not inclusive of 0, with the balance of Fe and unavoidable impurities; a Ti/C equivalent ratio represented by Formula (1) below is 0.4 to 1.5; a bainitic ferrite single phase or a phase comprising a bainitic ferrite phase and a ferrite phase exists as a main phase; an area ratio of a hard second phase and cementite is 3% or less; a ratio of small-angle boundaries with a difference in crystal orientation of 2° to 15° is 30% to 75%; and Ti-containing carbides having an average particle size of 20 nm or less are dispersed and precipitated:

$$\text{Ti/C equivalent ratio} = (\text{Ti}/48)/(\text{C}/12) \quad (1)$$

where a symbol of each element in Formula (1) is substituted by the content (mass%) of the element in the steel sheet material.

[Claim 2]

The high-strength steel sheet hot-dip coated with a Zn-Al-Mg-based system according to claim 1, wherein

the steel sheet material further contains, in percent by mass, one or more of Nb: 0.1% or less and V: 0.1% or less.

[Claim 3]
The high-strength steel sheet hot-dip coated with a Zn-Al-Mg-based system according to claim 1 or 2, wherein
a coating composition of the steel sheet hot-dip coated with a Zn-Al-Mg-based system includes, in percent by mass, Al: 3.0% to 22.0%, Mg: 0.05% to 10.0%, Ti: 0% to 0.10%, B: 0% to 0.05%, Si: 0% to 2.0%, Fe: 0% to 2.0%, with the balance of Zn and unavoidable impurities.

[Claim 4]
A method for manufacturing a high-strength steel sheet according to any one of claims 1 to 3 hot-dip coated with a Zn-Al-Mg-based system, in which a steel sheet material contains, in percent by mass, C: 0.005% to 0.08%, Si: 0.8% or lesser to an extent that still provides solid solution strengthening during manufacturing of the steel material, Mn: 0.1% to 1.8%, P: 0.05% or less but not inclusive of 0, S: 0.02% or less but not inclusive of 0, N: 0.001% to 0.005%, Ti: 0.02% to 0.2%, B: 0.0005% to 0.01%, and Al: 0.1% or less but not inclusive of 0, with the balance of Fe and unavoidable impurities, the steel sheet material having a Ti/C equivalent ratio represented by Formula (1) below of 0.4 to 1.5,
the method comprising the steps of hot rolling, pickling, and annealing and hot-dip coating with the Zn-Al-Mg system in a continuous hot-dip coating line performed sequentially, on the steel sheet material, wherein a coiling temperature in the hot rolling is from 500°C to 650°C and an annealing temperature in the continuous hot-dip coating line is from 550°C to 720°C:

$$\text{Ti/C equivalent ratio} = (\text{Ti}/48)/(\text{C}/12) \quad (1)$$

where a symbol of each element in Formula (1) is substituted by the content (mass%) of the element in the steel sheet material.

[Claim 5]
The method for manufacturing a high-strength steel sheet hot-dip coated with a Zn-Al-Mg-based system according to claim 4, wherein
the steel sheet material further contains, in percent by mass, one or more of Nb: 0.1% or less and V: 0.1% or less.

[Claim 6]
The method for manufacturing a high-strength steel sheet hot-dip coated with a Zn-Al-Mg-based system according to claim 4 or 5, wherein
a coating composition of the steel sheet hot-dip coated with a Zn-Al-Mg-based system includes, in percent by mass, Al: 3.0% to 22.0%, Mg: 0.05% to 10.0%, Ti: 0% to 0.10%, B: 0% to 0.05%, Si: 0% to 2.0%, Fe: 0% to 2.0%, with the balance of Zn and unavoidable impurities.