[Patent Document 8] JP 2007-191730 A

[Patent Document 9] JP 2008-144204 A

[Patent Document 10] JP 2010-018846 A

[Patent Document 11] JP 2011-021247 A

[Patent Document 12] JP 2011-021248 A

Summary

[0005a]

In one aspect of the present disclosure, there is provided an anti-corrosion steel material comprising:

a steel material, and

a coating film having a thickness of 10 μm or larger which is formed on the surface of the steel material; wherein

the steel material contains, in terms of % by mass,

C: 0.001% to 0.20%,

Si: 0.01% to 3.0%,

Mn: 0.1% to 3.0%, and

Cr: 0.1% to 9.99%;

the coating film is formed by curing an alkali-silicate inorganic zinc coating composition, the coating film contains a silicon atom, and at least one atom selected from an alkali metal atom and a nitrogen atom, and the molar ratio represented by {the number of moles of silicon atoms Si in the coating film}/{the total number of moles of alkali metal atoms and nitrogen atoms in the coating film} is 2.0 to 125; and

the inorganic zinc coating composition contains alkali silicate and zinc particles, and the mass ratio represented by "the solid content mass of a binder component / the mass of zinc particles" is 0.01 to 0.35.

[0005b]

In another aspect of the present disclosure, there is provided a ballast tank constituted by using the anti-corrosion steel material disclosed herein.

[0005c]

In a further aspect of the present disclosure, there is provided a manufacturing method of an anti-corrosion steel material comprising

a step of forming a coating film containing a silicon atom, and at least one atom selected from an alkali metal atom and a nitrogen atom, and having a molar ratio represented by {the number of moles of silicon atoms Si in the coating film} / {the total number of moles of alkali metal atoms and nitrogen atoms in the coating film} of 2.0 to 125,

by applying an alkali-silicate inorganic zinc coating composition containing alkali silicate and zinc particles and having a mass ratio represented by "the solid content mass of a binder component / the mass of zinc particles" of 0.01 to 0.35 on the surface of a steel material containing,

in terms of % by mass,

C: 0.001% to 0.20%,

Si: 0.01% to 3.0%,

Mn: 0.1% to 3.0%, and

Cr: 0.1% to 9.99%

such that the thickness of the cured coating film is 10 μm or larger.

[0005d]

In another aspect of the present disclosure, there is provided a method of preventing corrosion of a steel material comprising

a step of forming a coating film containing a silicon atom, and at least one atom selected from an alkali metal atom and a nitrogen atom, and having a molar ratio represented by {the number of moles of silicon atoms Si in the coating film} / {the total number of moles of alkali metal atoms and nitrogen atoms in the coating film} of 2.0 to 125,

by applying an alkali-silicate inorganic zinc coating composition containing alkali silicate and zinc particles and having a mass ratio represented by "the solid content mass of a binder component / the mass of zinc particles" of 0.01 to 0.35 on the surface of a steel material containing,

in terms of % by mass,

C: 0.001% to 0.20%,

Si: 0.01% to 3.0%,

Mn: 0.1% to 3.0%, and

Cr: 0.1% to 9.99%

such that the thickness of the cured coating film is 10 μm or larger.

Technical Problem

[0006]

In the corrosion prevention methods described in the Patent Documents or the like, while the composition of a steel material has an influence on corrosion resistance, the performance of a corrosion resistant steel material on which an inorganic zinc coating film is provided is a sacrificial corrosion prevention effect which is mainly due to zinc particles, and it is not assumed that other components or the like contained in the inorganic zinc coating film have influence on the performance of the corrosion resistant steel material on which the inorganic zinc coating film is provided. Therefore, fundamental improvement of the performance of the corrosion resistant steel material on which the inorganic zinc coating film is provided by considering the inorganic zinc coating film and the steel material as one is not attempted.

[0007]

In general, in order to obtain long-term corrosion

and a silicic acid.

9. The anti-corrosion steel material according to any one of claims 1 to 8, wherein the alkali silicate contains a quaternary ammonium silicate composed of a quaternary ammonium and a silicic acid.

10. The anti-corrosion steel material according to any one of claims 1 to 9, wherein in the inorganic zinc coating composition, the content of an alkyl silicate binder is 1% by mass or smaller and the content of an organic solvent is 0.5 % by mass or smaller based on the total amount of the composition.

11. The anti-corrosion steel material according to any one of claims 1 to 10, wherein the thickness of the coating film is 200 μm or smaller.

12. The anti-corrosion steel material according to any one of claims 1 to 11, which is composed of the steel material and the coating film, which does not comprise a top coating film on the coating film, and which is for a ballast tank.

13. The anti-corrosion steel material according to any one of claims 1 to 12, wherein

the steel material contains, in terms of % by mass,