CLAIMS

Claim 1

A surface-treated steel sheet comprising:

a steel sheet;

a plating layer containing zinc and formed on a surface of the steel sheet; and

a dry coating film formed on the plating layer,

wherein the dry coating film contains a resin component containing resin particles made of a polyurethane resin with an average particle size of more than or equal to 20 nm and less than or equal to 200 nm, P, Ti, V, and Si,

the dry coating film contains P at more than or equal to 2.5 mass% and less than or equal to 7.5 mass% on a phosphoric acid basis,

an area ratio of the resin component in a cross section of the dry coating film is more than or equal to 35% and less than or equal to 80%,

the resin particles are dispersed in the dry coating film,

a maximum value of a distance between centers of gravity of resin particles is less than or equal to 3.0 times an average particle size of the resin particle, and

a surface roughness (Ra) of the steel sheet is more than or equal to 0.1 μm and less than or equal to 2 μm.

Claim 2

The surface-treated steel sheet according to claim 1,

wherein a surface roughness (Ra) of the dry coating film is more than or equal to 1 nm and less than or equal to 10 nm.

Claim 3

The surface-treated steel sheet according to claim 1 or 2,

wherein the plating layer contains antimony.

Claim 4

The surface-treated steel sheet according to any one of claims 1 to 3,

wherein the resin component contains olefin-based wax and/or a phenolic resin.

Claim 5

The surface-treated steel sheet according to any one of claims 1 to 4,

wherein the dry coating film contains

Si at more than or equal to 10 mass% and less than or equal to 40 mass% on a SiO_2 basis,

Ti at more than or equal to 1.7 mass% and less than or equal to 2.4 mass%, and

V at more than or equal to 0.70 mass% and less than or equal to 0.90 mass%, and

a mass ratio between Ti and V (Ti/V) is more than or equal to 2.1 and less than or equal to 2.9.