tartrate, a sulfate, and boric acid and a salt thereof.

[0011]

[3] The cyanide-based silver alloy electroplating solution according to [1], wherein the germanium compound contains at least one selected from among germanium dioxide, germanium halide, tetraalkoxy germanium, germanium sulfide, and germanic acid and a salt thereof.

[0012]

[4] The cyanide-based silver alloy electroplating solution according to [1], wherein the coordinating polymer additive is at least one selected from among polyacrylic acid, polyethyleneimine, and a copolymer containing them in a structure thereof.

[0012a]

In one aspect, there is provided a cyanide-based silver alloy electroplating solution containing 10 to 100 g/L of a silver cyanide complex in terms of silver, 5 to 300 g/L of an electroconductive salt, 0.1 to 10 g/L of a germanium compound in terms of germanium, and 1 to 100 g/L of a coordinating polymer additive, wherein the coordinating polymer additive is at least one selected from among polyacrylic acid, polyethyleneimine, and a copolymer containing them in a structure thereof.

Advantageous Effects of Invention

[0013]

The cyanide-based silver alloy electroplating solution according to the present invention contains no antimony and makes it possible to obtain a silver-germanium alloy coating

having a lustrous appearance and a high hardness. This makes it possible to provide electric contact materials whose demand is increasing due to the popularization of electric cars while dealing with environmental restrictions that have become increasingly strict year by year. Further, the thickness of a silver coating can be reduced, which is economically advantageous.

Description of Embodiments

[0014]

CLAIMS

1. A cyanide-based silver alloy electroplating solution containing

10 to 100 g/L of a silver cyanide complex in terms of silver,

5 to 300 g/L of an electroconductive salt,

0.1 to 10 g/L of a germanium compound in terms of germanium, and

1 to 100 g/L of a coordinating polymer additive,

wherein the coordinating polymer additive is at least one selected from among polyacrylic acid, polyethyleneimine, and a copolymer containing them in a structure thereof.

2. The cyanide-based silver alloy electroplating solution according to claim 1, wherein the electroconductive salt contains at least one selected from among a cyanogen salt, a phosphate, a pyrophosphate, a nitrate, a citrate, a tartrate, a sulfate, and boric acid and a salt thereof.

3. The cyanide-based silver alloy electroplating solution according to claim 1, wherein the germanium compound contains at least one selected from among germanium dioxide, germanium halide, tetraalkoxy germanium, germanium sulfide, and germanic acid and a salt thereof.