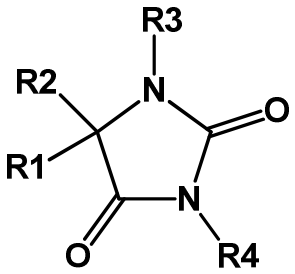
Claims

1. An aqueous cyanide-free electrolyte for the electrolytic deposition of silver and silver alloy coatings, which has the following constituents in dissolved form:

a) at least one silver compound in a concentration of 0.1 - 150 g/l silver,

b) at least one compound of an alloy metal in a concentration of 0 to 100 g/l alloy metal,

c) at least one compound of formula (I)



(I)

wherein

R1, R2, R3 and R4 independently represent hydrogen, a linear or branched alkyl group having 1 to 5 carbon atoms, an alkoxy group having 1 to 5 carbon atoms, a hydroxyalkyl group having 1 to 5 carbon atoms or an aryl group,

and

wherein the at least one compound of formula (I) is present in a concentration of 1 to 350 g/l,

d) at least one brightener carrier selected from

i. at least one amino acid in a concentration of 0.0001 - 5 mol/l, in particular 0.01 - 5 mol/l,

and/or

ii. at least one pyridinecarboxylic acid in a concentration of 0.01 - 5 mol/l

e) a brightening agent comprising or consisting of a sulfonamide having R_1-SO_2-NR_2R_3 as structural element, wherein R_1, R_2 and R_3 are, independently of one another, a (C_1-C_{10}) alkyl, a (C_3-C_{10}) cycloalkyl, a (C_6-C_{10}) aryl, a (C_5-C_{10}) heteroaryl, or a (C_5-C_{10}) heterocycloalkyl, wherein the concentration of the brightening agent is 0.005-25 g/l,

f) an alkali metal hydroxide selected from lithium hydroxide, sodium hydroxide, potassium hydroxide and mixtures thereof in a concentration of 1 - 200 g/l,

g) wherein the electrolyte has a pH of greater than or equal to 7.

2. The electrolyte according to claim 1, wherein the brightening agent further comprises 2,2'-sulfanediyldiethanol, cysteine, methionine, aliphatic and aromatic heterocyclic compounds having 5 to 7 ring atoms, wherein the ring of the aliphatic and aromatic heterocyclic compounds contains at least one heteroatom selected from nitrogen and sulfur, and wherein the aliphatic and aromatic heterocyclic compounds optionally contain one or more further heteroatoms selected from nitrogen, oxygen and sulfur, or mixtures thereof,

wherein, if the brightening agent comprises cysteine and/or methionine and at least one brightening carrier according to d)i) the at least one amino acid is neither cysteine nor methionine.

3. The electrolyte according to claim 1, wherein

the silver compound is selected from silver methanesulfonate, silver carbonate, silver phosphate, silver pyrophosphate, silver nitrate, silver oxide, silver lactate, silver fluoride, silver bromide, silver chloride, silver iodide and silver sulfate.

4. The electrolyte according to Claim 1, wherein

the compound of the at least one alloy metal is selected from compounds of tin, palladium, antimony, cobalt, indium, iron, nickel, ruthenium, rhodium, platinum, copper, zinc, selenium, tellurium, bismuth, iridium, germanium, gallium, rhenium, tungsten, molybdenum, dysprosium, cerium and gold.

5. The electrolyte according to Claim 1, wherein

the at least one compound of formula (I) is selected from 1-methylhydantoin, 1,3-dimethylhydantoin, 5,5-dimethylhydantoin, 1-hydroxymethyl-5,5-dimethylhydantoin, 5,5'-diethylhydantoin and 5,5-diphenylhydantoin and mixtures thereof.

6. The electrolyte according to Claim 1, wherein

the at least one amino acid is selected from glycine, alanine, proline, sarcosine and mixtures thereof.

7. The electrolyte according to Claim 1, wherein

the at least one pyridinecarboxylic acid is selected from picolinic acid, picolinic acid amide, nicotinic acid, nicotinamide, isonicotinic acid, isonicotinamide and mixtures thereof.