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BRASS, COPPER-TIN, AND COPPER PLATING BATH BRIGHTENER

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8 Claims. (Cl. 204—44)

This invention relates to new and useful improvements in plating baths and plating bath brighteners for brass, copper-tin and copper plating.

An object of the invention is to provide a single basic brightener which will operate satisfactorily and with equal results in brass, copper-tin and copper plating baths.

Another object of the invention is to accomplish what has long been desired in the art of electroplating—to deposit copper, copper-tin and brass in such a manner as to cause a smoothing out of the surface imperfections of the underlying metal plated and to maintain this surface over wide ranges in current densities and temperatures.

Still another object is to provide a brightener which will deposit copper, copper-tin or brass in a fully bright condition from the plating bath without agitation or periodic reverse of the bath.

Other objects, advantages and features of the invention will be apparent from the specification and appended claims.

The general composition of the brightener is the metals lead, arsenic, tin and vanadium and organic materials alkyl-aryl amine type wetting agent and ethylenediaminetetra acetic acid (Versene). However, either tellurium, selenium, antimony or bismuth in the same quantities as the vanadium in the examples hereinafter set forth can be used to replace the vanadium and good results still be obtained.

More specifically, the composition of the brightener is as follows:

	Ounces
Sodium hydroxide	16
Arsenic trioxide	6
Lead subacetate	.6
Sodium stannate	3
Vanadium pentoxide	.2
Ethylenediaminetetra acetic acid (Versene)	1.6
Wetting agent (alkyl-aryl amine type)	3.2
Water to make one gallon.	

The plating bath formulas, the proportions in which they should be maintained and the amount of brightener needed to produce the best result is as follows:

Copper plating bath

	Ounces per gallon
Free NaCN	4.8
CuCN	8.0
NaOH	8.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Vanadium (as metal)	.0009
Tin (as metal)	.02
Wetting agent	.5
Ethylenediaminetetra acetic acid (Versene)	.25

Copper-tin bath (bronze)

Free NaCN	1.8
$NaSnO_4$	3.5
CuCN	3.0
$KNaC_4H_4O_64H_2O$	6.0
NaOH	1.5
Arsenic (as metal)	.005
Lead (as metal)	.001

	Ounces per gallon
Tin (as metal)	.006
Vanadium (as metal)	.0003
Wetting agent	.16
Ethylenediaminetetra acetic acid (Versene)	.08

Yellow brass bath

Free NaCN	4.8
CuCN	8.0
NaOH	10.0
ZnCN	.5
$KNaC_4H_4O_64H_2O$	2.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Tin (as metal)	.02
Vanadium (as metal)	.0009
Wetting agent	.5
Versene	.25

All three types of plating baths are worked at temperatures from 135 to 160 degrees Fahrenheit and all three produce bright plated deposits at from 3 to 100 a.p.s.f. Agitation or periodic reverse is not required. The free NaCN is kept at the same ratio to copper cyanide in all three plating baths (.6 ounce of free sodium cyanide for each one ounce of copper cyanide which is contained in the plating bath). This ratio is kept regardless of any other metal present in the bath such as ZnCN in the brass or $NaSnO_4$ in the bronze.

The brightener provides bright deposits at the temperatures of the baths (135 to 160 degrees). High C/D can be employed without burning the deposit. Excellent color control is provided over wide range in C/D in the brass and bronze baths. There is 100% anode efficiency due to high tolerance to a high free NaCN content. A leveling of the basic metal occurs by the metal being deposited and the metal is deposited in a fully bright condition.

As above mentioned, the vanadium in the brightener can be replaced by tellurium, selenium, antimony or bismuth. Examples of plating baths showing such replacement are as follows:

Copper plating bath

	Ounces per gallon
Free NaCN	4.8
CuCN	8.0
NaOH	8.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Tellurium (as metal)	.0009
Tin (as metal)	.02
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Copper-tin bath (bronze)

Free NaCN	1.8
$NaSnO_4$	3.5
CuCN	3.0
$KNaC_4H_4O_64H_2O$	6.0
NaOH	1.5
Arsenic (as metal)	.005
Lead (as metal)	.001
Tellurium (as metal)	.003
Tin (as metal)	.006
Wetting agent	.16
Ethylenediaminetetra acetic acid	.08

Yellow brass bath

	Ounces per gallon
Free NaCN	4.8
CuCN	8.0
NaOH	10.0
ZnCN	.5
$KNaC_4H_4O_64H_2O$	2.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Tin (as metal)	.02
Tellurium (as metal)	.0009
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Copper plating bath

Free NaCN	4.8
CuCN	8.0
NaOH	8.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Selenium (as metal)	.0009
Tin (as metal)	.02
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Copper-tin bath (bronze)

Free NaCN	1.8
$NaSnO_4$	3.5
CuCN	3.0
$KNaC_4H_4O_64H_2O$	6.0
NaOH	1.5
Arsenic (as metal)	.005
Lead (as metal)	.001
Selenium (as metal)	.003
Tin (as metal)	.006
Wetting agent	.16
Ethylenediaminetetra acetic acid	.08

Yellow brass bath

Free NaCN	4.8
CuCN	8.0
NaOH	10.0
ZnCN	.5
$KNaC_4H_4O_64H_2O$	2.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Tin (as metal)	.02
Selenium (as metal)	.0009
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Copper plating bath

Free NaCN	4.8
CuCN	8.0
NaOH	8.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Antimony (as metal)	.0009
Tin (as metal)	.02
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Copper-tin bath (bronze)

Free NaCN	1.8
$NaSnO_4$	3.5
CuCN	3.0
$KNaC_4H_4O_64H_2O$	6.0
NaOH	1.5
Arsenic (as metal)	.005
Lead (as metal)	.001
Antimony (as metal)	.003
Tin (as metal)	.006
Wetting agent	.16
Ethylenediaminetetra acetic acid	.08

Yellow brass bath

	Ounces per gallon
Free NaCN	4.8
CuCN	8.0
NaOH	10.0
ZnCN	.5
$KNaC_4H_4O_64H_2O$	2.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Tin (as metal)	.02
Antimony (as metal)	.009
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Copper plating bath

Free NaCN	4.8
CuCN	8.0
NaOH	8.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Bismuth (as metal)	.0009
Tin (as metal)	.02
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Copper-tin bath (bronze)

Free NaCN	1.8
$NaSnO_4$	3.5
CuCN	3.0
$KNaC_4H_4O_64H_2O$	6.0
NaOH	1.5
Arsenic (as metal)	.005
Lead (as metal)	.001
Bismuth (as metal)	.0003
Wetting agent	.16
Ethylenediaminetetra acetic acid	.08

Yellow brass bath

Free NaCN	4.8
CuCN	8.0
NaOH	10.0
ZnCN	.5
$KNaC_4H_4O_64H_2O$	2.0
Arsenic (as metal)	.015
Lead (as metal)	.0034
Tin (as metal)	.02
Bismuth (as metal)	.0009
Wetting agent	.5
Ethylenediaminetetra acetic acid	.25

Having described my invention, I claim:

1. A brightener for plating a metal selected from the group consisting of copper, copper-tin and brass comprising the following in the following proportions, sixteen ounces sodium hydroxide, six ounces arsenic trioxide, six tenths ounce lead subacetate, three ounces sodium stannate, two tenths ounce vanadium pentoxide, one and six tenths ounces ethylenediaminetetra acetic acid tetrasodium salt, three and two tenths ounce alkyl-aryl amine type wetting agent and water sufficient to make one gallon of brightener.

2. A copper plating bath comprising the following in the following proportions per gallon: 4.8 ounces free sodium cyanide, 8.0 ounces copper cyanide, 8.0 ounces sodium hydroxide, .015 ounce arsenic (as metal), .0034 ounce lead (as metal), .0009 ounce vanadium (as metal), .02 ounce tin (as metal), .5 ounce wetting agent and .25 ounce ethylenediaminetetra acetic acid tetrasodium salt.

3. A copper-tin plating bath comprising the following in the following proportions per gallon: 1.8 ounces free sodium cyanide, 3.5 ounces $NaSnO_4$, 3.0 ounces copper cyanide, 6.0 ounces Rochelle salts, 1.5 ounces sodium hydroxide, .005 ounce arsenic (as metal), .001 ounce lead (as metal), .003 ounce vanadium (as metal), .006

ounce tin (as metal), .16 ounce wetting agent and .08 ounce ethylenediaminetetra acetic tetrasodium salt.

4. A yellow brass plating bath comprising the following in the following proportion per gallon: 4.8 ounces free sodium cyanide, 8.0 ounces copper cyanide, 10.0 ounces sodium hydroxide, .5 ounce zinc cyanide, 2.0 ounces Rochelle salts, .015 ounce arsenic (as metal), .0034 ounce lead (as metal), .02 ounce tin (as metal), .0009 ounce vanadium (as metal), .5 ounce wetting agent and .25 ounce ethylenediaminetetra acetic tetrasodium salt.

5. A yellow brass plating bath comprising the following in the following proportions per gallon: 4.8 ounces free sodium cyanide, 8.0 ounces copper cyanide, 10.0 ounces sodium hydroxide, .5 ounce zinc cyanide, 2.0 ounces Rochelle salts, .015 ounce arsenic (as metal), .15 ounce wetting agent, .25 ounce ethylenediaminetetra acetic tetrasodium salt and .0009 ounce of a metal (as metal) from the group consisting of selenium, bismuth, antimony and tellurium.

6. A copper plating bath comprising the following in the following proportions per gallon: 4.8 ounces free sodium cyanide, 8.0 ounces sodium hydroxide, .015 ounce arsenic (as metal), .0034 ounce lead (as metal), .02 ounce tin (as metal), .5 ounce wetting agent, .25 ounce ethylenediaminetetra acetic acid tetrasodium salt and .0009 ounce of a metal (as metal) from the group consisting of selenium, bismuth, antimony and tellurium.

7. A copper-tin plating bath comprising the following in the following proportions per gallon: 1.8 ounces free sodium cyanide, 3.5 ounces $NaSnO_4$, 3.0 ounces copper cyanide, 6.0 ounces Rochelle salts, 1.5 ounces sodium hydroxide, .005 ounce arsenic (as metal), .001 ounce lead (as metal), .006 ounce tin (as metal), .16 ounce wetting agent, .08 ounce ethylenediaminetetra acetic tetrasodium salt, and .0003 ounce of a metal (as metal) from the group consisting of selenium, bismuth, antimony and tellurium.

8. A brightener for plating a metal selected from the group consisting of copper, copper-tin and brass comprising the following in the following proportions: .6 ounce lead subacetate, 6.0 ounces arsenic trioxide, 3.0 ounces sodium stannate, .2 ounce vanadium pentoxide, .25 ounce ethylenediaminetetra acetic acid tetrasodium salt, .5 ounce wetting agent, 16.0 ounces sodium hydroxide and water to make one gallon of brightener.

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