

Claims

1. A process for depositing a metal layer on a substrate by
- contacting the substrate with a metal plating bath comprising a metal ion source and a suppressor, and
 - applying a current density to the substrate,

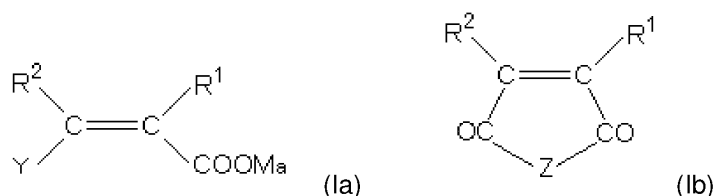
where the suppressor is a polycarboxylate ether obtainable by polymerizing a mixture of monomers comprising

- at least one ethylenically unsaturated monomer (I) which comprises at least one radical from the series carboxylic acid, carboxylic salt, carboxylic ester, carboxylic amide, carboxylic anhydride, and carboxylic imide; and
- at least one ethylenically unsaturated monomer (II) having a polyalkylene oxide radical.

15

2. The process according to claim 1 where the ethylenically unsaturated monomer (I) comprises at least one radical from the series carboxylic acid, carboxylic salt, and carboxylic amide.

3. The process according to claim 1 or 2 where the ethylenically unsaturated monomer (I) is represented by at least one of the following general formulae from the group (Ia), (Ib), and (Ic)

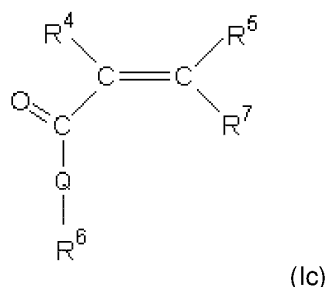


where

- 25 R^1 and R^2 independently of one another are hydrogen or an aliphatic hydrocarbon radical having 1 to 20 C atoms,
- Y is H, $-COOM_a$, $-CO-O(C_qH_{2q}O)_r-R^3$, or $-CO-NH-(C_qH_{2q}O)_r-R^3$,
- M is hydrogen, a mono- or divalent metal cation, ammonium ion, or an organic amine radical,
- 30 a is $\frac{1}{2}$ or 1,
- R^3 is hydrogen, an aliphatic hydrocarbon radical having 1 to 20 C atoms, a cycloaliphatic hydrocarbon radical having 5 to 8 C atoms, or an optionally substituted aryl radical having 6 to 14 C atoms,

- q independently at each occurrence for each $(C_qH_{2q}O)$ unit is identical or different and is 2, 3, or 4,
- r is 0 to 200, and
- Z is O or NR^3 ,

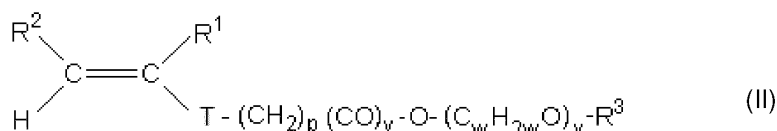
5



where

- R^4 and R^5 independently of one another are hydrogen or an aliphatic hydrocarbon radical having 1 to 20 C atoms, a cycloaliphatic hydrocarbon radical having 5 to 8 C atoms, or an optionally substituted aryl radical having 6 to 14 C atoms,
- Q is identical or different and is represented by NH, NR^3 , or O, where R^3 possesses the definition stated above,
- R^6 is identical or different and is represented by $(C_nH_{2n})-SO_3H$ with $n = 0, 1, 2, 3$, or 4, $(C_nH_{2n})-OH$ with $n = 0, 1, 2, 3$, or 4; $(C_nH_{2n})-PO_3H_2$ with $n = 0, 1, 2, 3$, or 4, $(C_nH_{2n})-OPO_3H_2$ with $n = 0, 1, 2, 3$, or 4, $(C_6H_4)-SO_3H$, $(C_6H_4)-PO_3H_2$, $(C_6H_4)-OPO_3H_2$, and $(C_nH_{2n})-NR^8_b$ with $n = 0, 1, 2, 3$, or 4 and $b = 2$ or 3,
- R^7 is H, $-COOM_a$, $-CO-O(C_qH_{2q}O)_r-R^3$, $-CO-NH-(C_qH_{2q}O)_r-R^3$, where M_a , R^3 , q, and r possess definitions stated above,
- R^8 is hydrogen, an aliphatic hydrocarbon radical having 1 to 10 C atoms, a cycloaliphatic hydrocarbon radical having 5 to 8 C atoms, or an optionally substituted aryl radical having 6 to 14 C atoms.

4. The process according to any of claims 1 to 3 where the ethylenically unsaturated monomer (II) is represented by the following general formula



in which

- p is an integer between 0 and 6,
- y is 0 or 1,

- v is an integer between 3 and 500,
w independently at each occurrence for each (C_wH_{2w}O) unit is identical or different and
is an integer between 2 and 18,
T is oxygen or a chemical bond,
5 where R¹, R², and R³ possess the definition stated above.
5. The process according to claim 4 where in the ethylenically unsaturated monomer (II) p is
an integer between 0 and 4, v is an integer between 5 and 250, and w independently at
each occurrence for each (C_wH_{2w}O) unit is identical or different and is 2 or 3.
- 10 6. The process according to claim 4 or 5 where in the ethylenically unsaturated monomer (II)
the R³ is an aliphatic hydrocarbon radical having 1 to 20 C atoms.
7. The process according to any of claims 1 to 6 where the ethylenically unsaturated
15 monomer (II) has a molecular weight of 500 to 10 000 g/mol.
8. The process according to any of claims 1 to 7 where the polycarboxylate ether has a
molecular weight of 1 000 to 100 000 g/mol.
- 20 9. The process according to any of claims 1 to 8 where the fraction of the monomer (I) in the
copolymer is 5 to 95 mol%.
10. The process according to any of claims 1 to 9 where the monomer (I) is a carboxylic
amide, such as N,N-dimethylacrylamide, N,N-dimethylmetacrylamide, N,N-diethylacryl-
25 amide, or N,N-diethylmethacrylamide.
11. The process according to any of claims 1 to 10 where the fraction of the monomer (II) in
the copolymer is 1 to 89 mol%.
- 30 12. The process according to any of claims 1 to 11 where the polycarboxylate ether is present
in the range from 1 to 10 000 mg/l based on the weight of the bath.
13. The process according to any of claims 1 to 12 where the metal ion source comprises a
copper salt.
- 35 14. The process according to any of claims 1 to 13 where the metal plating bath comprises an
accelerator which is a compound comprising one or more sulphur atom and a
sulfonic/phosphonic acid or their salts.

15. A metal plating bath comprising a metal ion source and a suppressor which is a polycarboxylate ether as defined in any of claims 1 to 14.
 16. A use of a suppressor which is a polycarboxylate ether as defined in any of claims 1 to 14
- 5 in a metal plating bath for depositing a metal layer on a substrate.