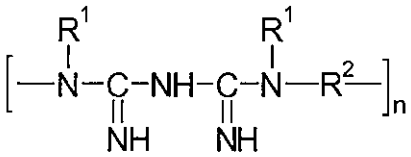
Claims

1. A composition comprising a source of metal ions, one or more suppressing agents and at least one additive comprising a linear or branched, polymeric biguanide compound comprising the structural unit of formula L1



(L1)

wherein

R^1 is, each independently, selected from an H atom or an organic radical having from 1 to 20 carbon atoms.

R^2 is a divalent organic radical having from 1 to 20 carbon atoms, optionally comprising polymeric biguanide branches.

n is an integer of 2 or more.

or the corresponding salt of the polymeric biguanide compound formed by the reaction of the biguanide groups with organic or inorganic acids.

2. The composition according to claim 1, wherein R^1 is selected from an H atom or substituted or unsubstituted C_1 to C_{10} alkyl radicals.

3. The composition according to anyone of the preceding claims, wherein R^1 is an H atom.

4. The composition according to anyone of the preceding claims, wherein R^2 is selected from substituted or unsubstituted linear C_2 to C_8 alkanediyl.

5. The composition according to anyone of the preceding claims, wherein n is from 2 to 6000.

6. The composition according to anyone of the preceding claims, wherein the number average molecular weight M_n of the polymeric biguanide compound, determined by gel permeation chromatography, is greater than 300 g/mol.

7. The composition according to anyone of the preceding claims, wherein the additive is preparable by reacting

- a dicyanamide compound,
- at least one amino compound comprising at least two primary and/ or secondary amino groups, and
- an inorganic or organic protic acid.

8. The composition according according to claim 7, wherein the at least one amino compound is an aliphatic or aromatic diamine, triamine, multiamine, or mixtures thereof.

9. The composition according according to claim 7, wherein the at least one amino compound is a terminal diamine.

10. The composition according to anyone of the preceding claims, wherein the metal ions comprise copper ion.

11. The composition according to anyone of the preceding claims, further comprising one or more accelerating agents.

12. The composition according to claim 11, wherein the accelerating agent is selected from compounds of formula $M^AO_3S\text{-}R^{A1}\text{-}S\text{-}S\text{-}R^{A1'}\text{-}SO_3M^A$, wherein

M^A is a hydrogen or an alkali metal,
X^A is P or S,
d is an integer from 2 to 4,
R^{A1} is selected from C1-C8 alkyl group or heteroalkyl group, an aryl group or a heteroaromatic group,
$R^{A1'}$ is selected from R^{A1}, wherein $R^{A1'}$ may be identical to or different from R^{A1},
$X^{A'}$ is selected from X^A, wherein $X^{A'}$ may be identical to or different from X^A, and
$M^{A'}$ is selected from M^A, wherein $M^{A'}$ may be identical to or different from M^A.

13. The composition according to claim 11, wherein the accelerating agent is bis-(3-sulfopropyl)-disulfide.

14. The composition according to anyone of the preceding claims, further comprising halide ions.

15. The composition according to claim 14, wherein the halide ions are chloride ions.

16. Use of an additive as defined in anyone of the preceding claims in a bath for depositing metal containing layers.

17. A process for depositing a metal layer on a substrate by
a) contacting a metal plating bath comprising a composition according to any of claims 1 to 16 with the substrate, and
b) applying a current density to the substrate for a time sufficient to deposit a metal layer onto the substrate.

18. The process according to claim 17, wherein the substrate comprises micrometer or nanometer sized features and the deposition is performed to fill the micrometer or nanometer sized features.

19. The process according to claim 18, wherein the micrometer or nanometer-sized features have a size from 1 to 1000 nm and/or an aspect ratio of 4 or more.

20. The process according to claim 18 or 19, wherein the micrometer or submicrometer-sized features have a size from 1 to 100 nm.

Claims

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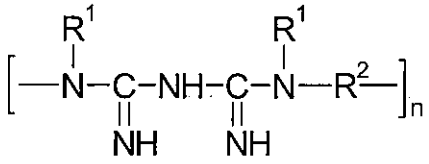

(L1)

wherein

R^1 is, each independently, selected from an H atom or an organic radical having from 1 to 20 carbon atoms.

R^2 is a divalent organic radical having from 1 to 20 carbon atoms, optionally comprising polymeric biguanide branches.

n is an integer of 2 or more.

or the corresponding salt of the polymeric biguanide compound formed by the reaction of the biguanide groups with organic or inorganic acids, wherein the composition does not contain halide ions.

2. The composition according to claim 1, wherein R^1 is selected from an H atom or substituted or unsubstituted C_1 to C_{10} alkyl radicals.

3. The composition according to anyone of the preceding claims, wherein R^1 is an H atom.

4. The composition according to anyone of the preceding claims, wherein R^2 is selected from substituted or unsubstituted linear C_2 to C_8 alkanediyl.

5. The composition according to anyone of the preceding claims, wherein n is from 2 to 6000.

6. The composition according to anyone of the preceding claims, wherein the number average molecular weight M_n of the polymeric biguanide compound, determined by gel permeation chromatography, is greater than 300 g/mol.

7. The composition according to anyone of the preceding claims, wherein the additive is preparable by reacting

- a dicyanamide compound,
- at least one amino compound comprising at least two primary and/ or secondary amino groups, and

- an inorganic or organic protic acid.

8. The composition according according to claim 7, wherein the at least one amino compound is an aliphatic or aromatic diamine, triamine, multiamine, or mixtures thereof.

9. The composition according according to claim 7, wherein the at least one amino compound is a terminal diamine.

10. The composition according to anyone of the preceding claims, wherein the metal ions comprise copper ion.

11. The composition according to anyone of the preceding claims, further comprising one or more accelerating agents.

12. The composition according to claim 11, wherein the accelerating agent is selected from compounds of formula $M^AO_3S\text{-}R^{A1}\text{-}S\text{-}S\text{-}R^{A1'}\text{-}SO_3M^A$, wherein

M^A is a hydrogen or an alkali metal,
X^A is P or S,
d is an integer from 2 to 4,
R^{A1} is selected from C1-C8 alkyl group or heteroalkyl group, an aryl group or a heteroaromatic group,
$R^{A1'}$ is selected from R^{A1}, wherein $R^{A1'}$may be identical to or different from R^{A1},
$X^{A'}$ is selected from X^A, wherein $X^{A'}$ may be identical to or different from X^A, and
$M^{A'}$ is selected from M^A, wherein $M^{A'}$ may be identical to or different from M^A.

13. The composition according to claim 11, wherein the accelerating agent is bis-(3-sulfopropyl)-disulfide.

14. Use of an additive as defined in anyone of the preceding claims in a bath for depositing metal containing layers.

15. A process for depositing a metal layer on a substrate by
    a) contacting a metal plating bath comprising a composition according to any of claims 1 to 14 with the substrate, and
    b) applying a current density to the substrate for a time sufficient to deposit a metal layer onto the substrate.

16. The process according to claim 15, wherein the substrate comprises micrometer or nanometer sized features and the deposition is performed to fill the micrometer or nanometer sized features.

17. The process according to claim 16, wherein the micrometer or nanometer-sized features have a size from 1 to 1000 nm and/or an aspect ratio of 4 or more.

18. The process according to claim 16 or 17, wherein the micrometer or submicrometer-sized features have a size from 1 to 100 nm.