Claims

1. A composition for copper electroplating comprising a source of copper ions, one or more suppressing agents, one or more accelerating agents of formula $M^AO_3X^A\text{-}R^{A1}\text{-}(S)_d\text{-}R^{A2}$, wherein

M^A is a hydrogen or an alkali metal,

X^A is P or S,

d is an integer from 2 to 3,

R^{A1} is selected from C1-C8 alkyl group or heteroalkyl group, an aryl group or a heteroaromatic group,

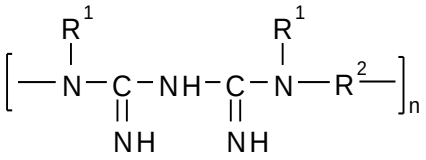
R^{A2} is selected from H or $(–S\text{-}R^{A1\prime}X^{A\prime}O_3M^{A\prime})$,

$R^{A1\prime}$ is selected among R^{A1}, wherein $R^{A1\prime}$may be identical to or different from R^{A1},

$X^{A\prime}$ is selected among X^A, wherein $X^{A\prime}$ may be identical to or different from X^A, and

$M^{A\prime}$ is selected from M^A, wherein $M^{A\prime}$ may be identical to or different from M^A,

characterized by that the composition comprises halide ions, and at least one leveling agent 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, and wherein the suppressing agent is a polyalkylene oxide.

2. The composition according to claim 1, characterized in that 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, characterized in thatR^1 is an H atom.

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

5. The composition according to anyone of the preceding claims, characterized in that n is

from 2 to 6000.

6. The composition according to anyone of the preceding claims, characterized in thatthe 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, characterized in that the accelerator is a compound 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,
R^{A1} is selected from C1-C8 alkyl group.

8. The composition according to claim 7, wherein the accelerating agent is bis-(3-sulfopropyl)-disulfide.

9. The composition according to anyone of the preceding claims, wherein the halide ions are chloride ions.

10. Use of a composition according to anyone of the preceding claims in a bath for depositing copper containing layers.

11. 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 9 with the substrate, and
b) applying a current density to the substrate for a time sufficient to deposit a metal layer onto the substrate.

12. The process according to claim 11, wherein the substrate comprises micrometer or nanometer sized features and the deposition is performed to fill the micrometer or nanometer sized features.

13. The process according to claim 12, wherein the micrometer or nanometer-sized features have a size from 1 to 1000 nm and/or an aspect ratio of 4 or more.

14. The process according to claim 12 or 13, wherein the micrometer or nanometer-sized features have a size from 1 to 100 nm.