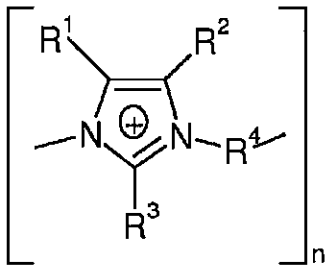
Claims

1. A composition comprising a copper salt in an amount of from 1 to 300 g/l, an aqueous acidic electrolyte and at least one additive comprising a linear or branched, polymeric imidazolium compound comprising the structure of formula L1



(L1)

wherein

R^1, R^2, R^3 are each independently selected from an H atom and an organic radical having from 1 to 20 carbon atoms,

n is an integer of from 2 to 6000,

charaterized in that

R^4 is a divalent, trivalent or multivalent organic radical which does not comprise a hydroxyl group in the α or β position relative to the nitrogen atoms of the imidazole rings.

2. The composition according to claim 1, wherein R^1 and R^2 are H atoms.

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

4. The composition according to anyone of the preceding claims, wherein R^4 is substituted or unsubstituted C2 to C20 alkandiyl.

5. The composition according to claim 4, wherein R^4 does not comprise hydroxyl groups.

6. The composition according to anyone of the preceding claims, wherein the at least one additive comprises a counterion Y^{o-}, wherein o is an integer of from 1 to 4.

7. The composition according to claim 6, wherein the counterion Y^{o-} is chloride, sulfate or acetate.

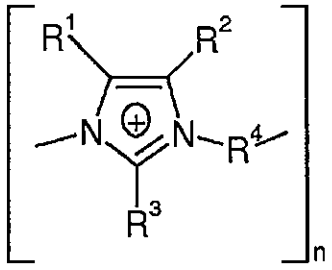
8. The composition according to anyone of the preceding claims, wherein the number average molecular weight M_n of the polymeric imidazolium compound, determined by gel permeation chromatography, is greater than 500 g/mol.

9. The composition according to anyone of the preceding claims, wherein the polymeric imidazolium compound comprises more than 80% by weight of structural units of the formula L1.

10. The composition according to anyone of the preceding claims, further comprising one or more accelerating agents of formula $M^AO_3X^A\text{-}R^{A1}\text{-}(S)_d\text{-}R^{A2}$,
wherein:
    - M^A is hydrogen or an alkali metal,
    - X^A is P or S,
    - d = 1 to 6,
    - R^{A1} is selected from C1-C8 alkyl group or heteroalkyl group having one or more heteroatoms N, S, O and 1-12 carbons, an aryl group or a heteroaromatic group containing one or more N, O or S atoms and 1-3 separate or fused rings.
    - R^{A2} is selected from H or $(\text{-S-}R^{A1'}XO_3M^{A'})$, with $R^{A1'}$ being selected among R^{A1}, wherein $R^{A1'}$ may be identical to or different from R^{A1}, and $M^{A'}$ is selected among M^A, wherein $M^{A'}$ may be identical to or different from M^A

11. The composition according to anyone of the preceding claims, further comprising one or more suppressing agents selected from polyalkyleneoxides.

12. Use of an additive comprising a linear or branched, polymeric imidazolium compound comprising the structural unit of formula L1



(L1)

wherein

R^1, R^2, R^3 are each independently selected from an H atom and an organic radical having from 1 to 20 carbon atoms,
n is an integer of from 2 to 6000,

in a bath for depositing copper containing layers, charaterized in that

R^4 is a divalent, trivalent or multivalent organic radical which does not comprise a hydroxyl group in the α or β position relative to the nitrogen atoms of the imidazole rings.

13. A process for depositing a copper layer on a substrate by

a) contacting a copper plating bath comprising a composition according to any of claims 1 to 11 with the substrate, and

b) applying a current density to the substrate for a time sufficient to deposit a metal layer onto the substrate.

14. The process according to claim 13, wherein the substrate comprises micrometer or submicrometer sized features and the deposition is performed to fill the micrometer or submicrometer sized features.

15. The process according to claim 14, wherein the micrometer or submicrometer-sized features have a size from 1 to 1000 nm and/or an aspect ratio of 4 or more.