Claims

1. A composition comprising a source of metal ions and at least one suppressing agent obtainable by reacting

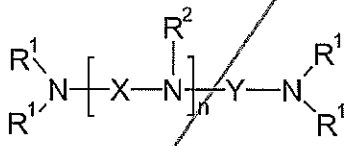
   a) an amine compound comprising at least three active amino functional groups

   with

   b) a mixture of ethylene oxide and at least one compound selected from C3 and C4 alkylene oxides

2. The composition according to claim 1, wherein the metal ions comprise copper ions.

3. The composition according to anyone of the preceding claims, wherein the suppressing agent is selected from compounds of formula I



(I)

wherein

- the R^1 radicals are each independently selected from a copolymer of ethylene oxide and at least one further C3 to C4 alkylene oxide, said copolymer being a random copolymer.
- the R^2 radicals are each independently selected from R^1 or alkylen, preferably C1
- X and Y are spacer groups independently, and X for each repeating unit independently, selected from C1 to C6 alkylen and $Z-(O-Z)_m$ wherein the Z radicals are each independently selected from C2 to C6 alkylen,
- n is an integer equal to or greater than 1.
- m is an integer equal to or greater than 1, particularly m = 1-10.

4. The composition according to claim 3, wherein X and Y are independently, and X for each repeating unit independently, selected from C1 to C4 alkylen.

5. The composition according to anyone of the preceding claims, wherein the amine compound is selected from diethylene triamine, 3-(2-aminoethyl)aminopropylamine, 3,3´-iminodi(propylamine), N,N-bis(3-aminopropyl)methylamine, bis(3-dimethylaminopropyl)amine, triethylenetetraamine and N,N´-bis(3-aminopropyl)ethylenediamine.

6. The composition according to anyone of the preceding claims, wherein the C3 to C4 alkylene oxide is selected from propylene oxide.

7. The composition according to anyone of the preceding claims, wherein the content of ethylene oxide in the copolymer of ethylene oxide and the further C3 to C4 alkylene oxide is from 30 to 70 %.

8. The composition according to anyone of the preceding claims, wherein the molecular weight M_w of the suppressing agent is 6000 g/mol or more.

9. The composition according to claim 8, wherein the molecular weight M_w of the suppressing agent is from 7000 to 19000 g/mol.

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

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

12. Use of a metal plating bath comprising a composition according to claim 1 for depositing the metal on substrates comprising features having an aperture size of 30 nanometers or less.

13. 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 12 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 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 submicrometer-sized features have an aperture size from 1 to 30 nm and/or an aspect ratio of 4 or more.

Claims

1. A composition comprising a source of metal ions and at least one suppressing agent obtainable by reacting

   a) an amine compound comprising three to twelve active amino functional groups

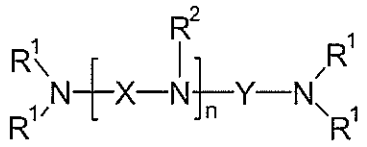
   with

   b) a mixture of ethylene oxide and at least one compound selected from C3 and C4 alkylene oxides,

   to form random copolymers of the ethylene oxide and the further C3 to C4 alkylene oxide.

2. The composition according to claim 1, wherein the metal ions comprise copper ions.

3. The composition according to anyone of the preceding claims, wherein the suppressing agent is selected from compounds of formula I



(I)

   wherein

   - the R^1 radicals are each independently selected from a copolymer of ethylene oxide and at least one further C3 to C4 alkylene oxide, said copolymer being a random copolymer.

   - the R^2 radicals are each independently selected from R^1 or alkylen, preferably C1

   - X and Y are spacer groups independently, and X for each repeating unit independently, selected from C1 to C6 alkylen and $Z\text{-}(O\text{-}Z)_m$ wherein the Z radicals are each independently selected from C2 to C6 alkylen,

   - n is an integer equal to or greater than 1.

- m is an integer equal to or greater than 1, particularly m = 1-10.

4. The composition according to claim 3, wherein X and Y are independently, and X for each repeating unit independently, selected from C1 to C4 alkylen.

5. The composition according to anyone of the preceding claims, wherein the amine compound is selected from diethylene triamine, 3-(2-aminoethyl)aminopropylamine, 3,3´-iminodi(propylamine), N,N-bis(3-aminopropyl)methylamine, bis(3-dimethylaminopropyl)amine, triethylenetetraamine and N,N´-bis(3-aminopropyl)ethylenediamine.

6. The composition according to anyone of the preceding claims, wherein the C3 to C4 alkylene oxide is selected from propylene oxide.

7. The composition according to anyone of the preceding claims, wherein the content of ethylene oxide in the copolymer of ethylene oxide and the further C3 to C4 alkylene oxide is from 30 to 70 % by weight.

8. The composition according to anyone of the preceding claims, wherein the molecular weight M_w of the suppressing agent is 6000 g/mol or more.

9. The composition according to claim 8, wherein the molecular weight M_w of the suppressing agent is from 7000 to 19000 g/mol.

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

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

12. Use of a metal plating bath comprising a composition according to claim 1 for depositing the metal on substrates comprising features having an aperture size of 30 nanometers or less.

13. 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 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 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 submicrometer-sized features have an aperture size from 1 to 30 nm and/or an aspect ratio of 4 or more.