

WHAT IS CLAIMED IS

- 5 1. An autocatalytic gold bath capable of depositing gold from solution onto a surface, the autocatalytic gold bath comprising:
- a. a chelator;
- b. a gold salt; and
- c. a reducing agent, wherein the reducing comprises an organic molecule having more than one carbon atom on the organic molecule.
- 10 2. The autocatalytic gold bath according to claim 1, wherein the chelator is selected from the group consisting of ethylenediamine tetraacetic acid, Rochelle salts, carboxylic acids and combinations of one or more of the foregoing.
3. The autocatalytic gold bath according to claim 1, wherein the gold salt is selected from the group consisting of potassium gold cyanide, gold sulfite, gold iodide, gold chloride, gold bromide, and combinations of one or more of the foregoing.
- 15 4. The autocatalytic gold bath according to claim 1, wherein the reducing agent comprises additional alcohols, carboxylic acids and/or nitrogen groups.
5. The autocatalytic gold bath according to claim 1, wherein the reducing agent is an aldehyde bisulfite compound containing two or more carbon atoms.
- 20 6. The autocatalytic gold bath according to claim 5, wherein the reducing agent is selected from the group consisting of 2-methoxybenzaldehyde sodium bisulfite addition compound, acetone sodium bisulfite addition compound, succinaldehyde sodium bisulfite addition compound, P-anisaldehyde sodium bisulfite addition compound, glutaraldehyde bisulfite addition compound and combinations of one or more of the foregoing.

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7. The autocatalytic gold bath according to claim 1, wherein the bath is maintained at a pH in the range of about 6 to about 9.
8. The autocatalytic gold bath according to claim 1, wherein the bath is maintained at a temperature in the range of about 75 to about 95°C.
- 5 9. A method of providing a gold final finish on a substrate by autocatalytic gold plating, the method comprising the steps of:
- a) providing a substrate with one or more metal layer thereon; and
 - b) contacting the substrate with the one or more metal layers with a gold plating bath to deposit gold metal thereon, the gold plating bath comprising:
- 10 b) contacting the surface of the substrate with an autocatalytic gold plating solution comprising:
- i) a chelator;
 - ii) a gold salt; and
 - 15 iii) a reducing agent, wherein the reducing agent comprises an organic molecule having more than one carbon atom on the organic molecule;
- wherein the gold is deposited on the one or more metal layers, wherein the solderability of the one or more metal layers is increased.
10. The method according to claim 9, wherein the one or more metal layers comprise palladium and/or nickel.
- 20 11. The method according to claim 9, wherein the gold is plated onto an electroless nickel plated layer over copper features of a semiconductor substrate or printed circuit board.

12. The method according to claim 11, wherein the electroless nickel layer comprises a palladium-plated film over the top of the nickel layer to prevent diffusion of the nickel layer to the gold deposit.
13. The process according to claim 9, wherein the gold plating bath deposits a final finish to the surface of the one or more metal layers, wherein the one or more metal layers are formed in an ENIG, ENEPIG, EPAG, direct gold over copper or gold over silver process.
14. The process according to claim 9, wherein the substrate is a circuit board and gold is deposited as a final finish to the one or more metal layers on the circuit board, wherein the deposited gold increases solderability of the one or more metal layers.
15. The method according to claim 9, wherein the reducing agent comprises additional alcohols, carboxylic acids and/or nitrogen groups.
16. The method according to claim 9, wherein the reducing agent is an aldehyde bisulfite compound containing two or more carbon atoms.
17. The method according to claim 16, wherein the reducing agent is selected from the group consisting of 2-methoxybenzaldehyde sodium bisulfite addition compound, acetone sodium bisulfite addition compound, succinaldehyde sodium bisulfite addition compound, P-anisaldehyde sodium bisulfite addition compound, glutaraldehyde sodium bisulfite addition compound and combinations of one or more of the foregoing.
18. A circuit board comprising a metal film stack thereon, wherein the metal film stack comprises one or more metal layers formed in an ENIG, ENEPIG, EPAG, direct gold over copper or gold over silver process, wherein a gold plated finish is deposited on the metal film stack by the method of claim 9.