CLAIMS

1**.** An electroless nickel plating solution, comprising

- a source of nickel ions,
- a source of molybdenum ions,
- a source of tungsten ions,
- a source of hypophosphite ions,
- at least one complexing agent,

wherein the solution does not comprise any reducing agent comprising boron,
characterised in that the solution further comprises

- at least one organic sulphur containing compound in a concentration of 0.38 - 38.00 µmol/L, and
- at least one amino acid in a concentration of 0.67 - 40.13 mmol/L.

2. The plating solution of claim 1, wherein the molar ratio of amino acid to organic sulphur containing compound is from 282 : 1 to 14,079 : 1.

3. The plating solution of one or more of the preceding claims, wherein a concentration of hypophosphite ions is 0.09 - 0.27 mol/L.

4. The plating solution of one or more of the preceding claims, wherein a concentration of nickel ions is 0.067 - 0.133 mol/L.

5. The plating solution of one or more of the preceding claims, wherein a concentration of molybdenum ions is 1.05 - 4.18 mmol/L.

6. The plating solution of one or more of the preceding claims, wherein a concentration of tungsten ions is 12.1 - 109.2 mmol/L.

7. The plating solution of one or more of the preceding claims, wherein the amino acid is a non-sulphur containing amino acid, preferably the amino acid is selected from the group consisting of glycine, alanine, valine, leucine and isoleucine.

8. The plating solution of one or more of the preceding claims, wherein the organic sulphur containing compound is selected from the group consisting of N,N-dimethyl-dithiocarbamyl propyl sulfonic acid, 3-Mercaptopropane sulfonic acid, 3,3-Dithiobis-1-propane sulfonic acid, 3-(2-Benzthiazolylmercapto)propane sulfonic acid, 3-[(Ethoxy-thioxomethyl)thio]-1-propane sulfonic acid, 3-S-Isothiuroniumpropane sulfonate, sodium diethlydithiocarbamate, thiodiacetic acid, dithiodiacetic acid, thiodiglycolic acid, dithiodiglycolic acid, thiosulfate, thiourea, thiocyanate, cystein and cystine.

9. The plating solution of one or more of the preceding claims, wherein the complexing agent is selected from the group consisting of citric acid, isocitric acid, EDTA, EDTMP, HDEP and Pyrophosphate.

10. A method for electroless plating of a nickel alloy layer (5) on a substrate (2), particularly a wafer (3), the method comprising contacting said substrate with an electroless nickel plating

solution according to one or more of claims 1 - 9.

11. The method of claim 10, wherein the substrate comprises a copper layer (4) or aluminium layer, wherein the nickel alloy layer (5) is plated on the copper layer (4) or the aluminium layer.

12. A quaternary nickel alloy layer obtained from an electroless nickel plating solution of one or more of claims 1-9, comprising

- 81.5 to 98.4 wt% nickel
- 1 to 10 wt% molybdenum
- 0.1 to 4 wt% tungsten
- 0.5 to 4.5 wt% phosphor,

wherein the nickel alloy layer having a normal stress in the range of -40 to +120 N/mm^2, measured by following Bent Strip Method according to ASTM Standard B975: Deposition on Copper-Iron Alloy PN: 1194 stress stripes with subsequent stress determination by use of the Deposit Stress Analyzer.

13. An article (1), particularly a semiconductor chip or wafer, comprising a nickel alloy layer (5), wherein the nickel alloy layer is a nickel alloy layer according to claim 12 or a nickel alloy layer which is obtained according to a method of claim 10 or 11.

14. The article of claim 13, wherein the article comprises a stack of layers, in this order:
a copper layer or an aluminium layer followed by the nickel alloy layer and a palladium and/or gold layer, wherein the palladium layer is preferably an outer layer.

15. Use of the electroless nickel plating solution according to one or more of the claims 1-9 for producing a barrier layer according to claim 12 between two metal layers, in particular between a copper layer or an aluminium layer and a palladium or a gold layer.