Claims

1. A method for forming copper on a substrate comprising:

inputting a copper source solution into a mixer;

inputting a reducing solution into the mixer, the reducing solution including at least one cobalt ion instead of an aldehyde;

mixing the copper source solution and the reducing solution to form a plating solution having a pH of ~~greater than about 6.5~~ between 7.2 and 7.8; and

applying the plating solution to a substrate, the substrate including a catalytic layer and wherein the substrate includes a patterned photoresist layer formed on the catalytic layer, wherein the photoresist layer does not have a protection later, wherein applying the plating solution to the substrate includes forming copper on the catalytic layer,

wherein the method further comprises discarding the plating solution after forming copper on the catalytic layer.

2. The method of claim 1, wherein the plating solution is created ~~substantially~~ simultaneously with applying the plating solution to the substrate.

~~3. The method of claim 1, wherein the plating solution has a pH of between about 7.2 and about 7.8.~~

~~4. The method of claim 1, further comprising, discarding the plating solution after forming copper on the catalytic layer.~~

~~5.~~3. The method of claim 1, ~~wherein the substrate includes a patterned photoresist layer and~~ wherein the patterned photoresist layer exposes a first portion of the catalytic layer and wherein applying the plating solution to the substrate includes forming copper on the first portion of the catalytic layer.

~~6.~~4. The method of claim ~~5~~ 3, further comprising:

removing the plating solution from the substrate;

rinsing the substrate; and

drying the substrate.

~~7.~~5. The method of claim ~~6~~ 4, further comprising:

removing the patterned photoresist, wherein removing the patterned photoresist exposes a second portion of the catalytic layer; and

removing the second portion of the catalytic layer.

~~8. The method of claim 5, wherein the plating solution is compatible with an unprotected photoresist.~~

~~9.~~6. The method of claim 1, wherein the copper formed on the catalytic layer is ~~substantially~~ elemental copper~~, wherein the copper formed on the catalytic layer is substantially free of hydrogen inclusions~~.

7. The method of claim 1, wherein the copper formed on the catalytic layer is free of hydrogen inclusions.

~~10.~~8. The method of claim 1, wherein the copper formed on the catalytic layer is formed at a rate ~~of~~ greater than ~~about~~ 500 angstrom per minute.

9. The method of claim 1, wherein the plating solution is applied to the substrate through a dynamic liquid meniscus and wherein the dynamic liquid meniscus is formed between a proximity head and a surface of the substrate.

~~11.~~10. The method of claim 1, wherein the copper source solution includes:

an oxidizing copper source;

a complexing agent;

a pH adjuster agent; and

a halide ion.

11. The method of claim 1, wherein the catalytic layer includes more than one layer.

12. The method of claim 11, wherein the catalytic layer includes a bottom anti-reflection coating (BARC) layer thereon.

~~12.~~13. Method for forming a patterned copper structure on a substrate comprising:

receiving a substrate including:

a catalytic layer formed thereon; and

a patterned photoresist layer formed on the catalytic layer wherein the patterned photoresist layer exposes a first portion of the catalytic layer and wherein the patterned photoresist layer covers a second portion of the catalytic layer and wherein the patterned photoresist layer does not have a protective layer;

inputting a copper source solution into a mixer;

inputting a reducing solution into the mixer, the reducing solution including a cobalt ion instead of an aldehyde;

mixing the copper source solution and the reducing solution to form a plating solution having a pH of between ~~about~~ 7.2 and ~~about~~ 7.8; ~~and~~

applying the plating solution to a substrate wherein applying the plating solution to the substrate includes forming copper on the first portion of the catalytic layer; and

discarding the plating solution after forming copper on the catalytic layer.

~~13.~~14. A process tool comprising:

a low pressure process chamber;

an atmospheric pressure process chamber including a copper plating chamber, the copper plating chamber including a mixer;

a transfer chamber coupled to each of the low pressure process chamber and the atmospheric pressure process chamber, the transfer chamber including a controlled environment, the transfer chamber providing a controlled environment for transferring a substrate from the low pressure process chamber to the atmospheric pressure process chamber; and

a controller coupled to the low pressure process chamber, the atmospheric pressure process chamber and the transfer chamber, the controller including logic to

control each of the low pressure process chamber, the atmospheric pressure process chamber and the transfer chamber, wherein the controller includes a receipt including:

logic for loading a patterned substrate into the copper plating chamber;

logic for inputting a copper source solution into the mixer;

logic for inputting a reducing solution into the mixer;

logic for mixing the copper source solution and the reducing solution to form a plating solution having a pH of between 7.2 and 7.8;

logic for applying the plating solution to a patterned substrate, the patterned substrate including a catalytic layer wherein applying the plating solution to the substrate includes forming copper on the catalytic layer; and

logic for discarding the plating solution after forming copper on the catalytic layer.

~~14.~~15. The process tool of claim ~~13~~ 14, wherein the low pressure process chamber includes more than one low pressure process chambers including one or more plasma etch~~/removal~~ chambers, wherein ~~and the atmospheric pressure process chamber includes a copper plating chamber.~~

the plasma etch chambers remove an exposed portion of the catalytic layer on which the copper is not formed.

~~15. The process tool of claim 14, wherein the copper plating chamber includes a mixer.~~

16. The process tool of claim ~~14~~ 15, wherein the plasma etch chamber is a downstream plasma chamber.

17. The process tool of claim ~~14~~ 15, wherein the plasma etch~~/removal~~ chamber is a wet process chamber.

18. The process tool of claim ~~13~~ 14, wherein the transfer chamber includes an ~~input/output~~ input-output module~~;~~, wherein

the input-output module can allow the substrate to be transferred into and out of the low pressure process chamber and the atmospheric process chamber.

~~19. The process tool of claim 13,wherein the control system includes a recipe including:~~

~~logic for loading a patterned substrate into the copper plating chamber;~~

~~logic for inputting a copper source solution into the mixer;~~

~~logic for inputting a reducing solution into the mixer;~~

~~logic for mixing the copper source solution and the reducing solution to form a plating solution having a pH of greater than about 6.5; and~~

~~logic for applying the plating solution to a patterned substrate, the patterned substrate including a catalytic layer wherein applying the plating solution to the substrate includes forming copper on the catalytic layer.~~

~~20.~~19. The process tool of claim ~~19~~ 14, wherein the patterned substrate includes a patterned photoresist layer formed on the catalytic layer wherein the patterned photoresist layer exposes a first portion of the catalytic layer and wherein the patterned photoresist layer covers a second portion of the catalytic layer.