

We claim:

1. A method comprising:
providing a substrate having a metal deposited in features in the substrate, the
5 substrate having a frontside, a backside, and an edge; and
performing a non-plasma inhibition treatment on surfaces of the deposited metal to
inhibit nucleation on the treated surfaces, the non-plasma inhibition treatment comprising
flowing an inhibition gas from a gas inlet on the frontside of the substrate and flowing the
inhibition gas from the backside of the substrate around the edge of the substrate.
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2. The method of claim 1, wherein the non-plasma inhibition treatment further
comprises flowing a metal precursor from a gas inlet on the frontside of the substrate.
3. The method of claim 2, wherein no metal precursor is flowed from the backside of
15 the substrate.
4. The method of claim 1, wherein flowing the inhibition gas from the gas inlet on the
frontside of the substrate is performed concurrently or partially overlaps with flowing the
inhibition gas from the backside of the substrate.
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5. The method of claim 1, wherein flowing the inhibition gas from the gas inlet on the
frontside of the substrate is alternated with flowing the inhibition gas from the backside of
the substrate.
- 25 6. The method of claim 5, wherein the non-plasma inhibition treatment comprises an
anneal period between flowing the inhibition gas from a gas inlet on the frontside of the
substrate and flowing the inhibition gas from the backside of the substrate.
7. The method of claims 1–6, wherein the metal is one of tungsten (W), molybdenum
30 (Mo), cobalt (Co), and ruthenium (Ru).
8. The method of any of claims 1–6, wherein the inhibition gas is a nitrogen-
containing gas.
- 35 9. The method of claim 8, wherein the inhibition gas is ammonia (NH₃) or hydrazine
(N₂H₄).

10. The method of any claims 1–6, further comprising, after the non-plasma inhibition treatment, exposing the features to a metal precursor and a reducing agent to deposit metal in the features, wherein deposition of the metal is delayed on the treated surfaces.

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11. The method of claim 10, wherein the non-plasma inhibition treatment and the deposition are performed in different stations of a multi-station chamber.

12. The method of any claims 1–6, wherein providing the substrate having a metal deposited in features in the substrate comprises depositing metal in the features.

13. The method of any of claims 1–6, wherein flowing the inhibition gas from the backside of the substrate around the edge of the substrate comprises flowing the inhibition gas from the backside of the substrate to a volume under an exclusion ring.

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14. An apparatus comprising:

a multi-station chamber, each station comprising a pedestal comprising a top surface and an annular recess in the top surface configured to be fluidically connected to a backside gas source; an exclusion ring on the pedestal; and a showerhead disposed over the pedestal and configured to be fluidically connected to a frontside gas source; and a controller comprising instructions for:

flowing a metal precursor and a reducing agent through the showerhead of a first station housing a substrate to deposit a metal film thereon;

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transferring the substrate to a second station and flowing an inhibition gas through the showerhead and flowing the inhibition gas from the backside gas source through the annular recess; and

transferring the substrate to a third station and flowing a metal precursor and a reducing agent through the showerhead to deposit a metal film thereon.

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15. The apparatus of claim 14, wherein the controller comprises instructions for flowing the inhibition gas through the annular recess without flowing metal precursor through the annular recess.

16. The apparatus of claim 14, wherein the controller comprises instructions for flowing the inhibition gas from the showerhead concurrently or partially overlapping with flowing the inhibition gas through the annular recess.

5 17. The apparatus of claim 14, wherein the controller comprises instructions for alternating the flow of the inhibition gas from the showerhead with the flow of the inhibition gas through the annular recess.

10 18. An apparatus comprising:
a chamber comprising a pedestal comprising a top surface and an annular recess in the top surface configured to be fluidically connected to a backside gas source; an exclusion ring on the pedestal; and a showerhead disposed over the pedestal and configured to be fluidically connected to a frontside gas source; and
15 a controller comprising instructions for:
flowing a metal precursor and an inhibition gas through the showerhead and flowing the inhibition gas without a metal precursor through the annular recess.

19. The apparatus of claim 18, wherein the controller comprises instructions for
20 flowing the inhibition gas from the showerhead concurrently or partially overlapping with flowing the inhibition gas through the annular recess.

20. The apparatus of claim 18, wherein the controller comprises instructions for
alternating the flow of the inhibition gas from the showerhead with the flow of the
25 inhibition gas through the annular recess.