

CLAIMS

What is claimed is:

1. A method comprising:
 - providing a substrate having structure including a gap to be filled;
 - 5 depositing a protective liner selectively at an upper portion of the structure such that it extends only partially into the gap; and
 - performing one or more cycles of:
 - (a) exposing the substrate to a plasma comprising halogen species to inhibit deposition on a portion of the gap;
 - 10 (b) after (a), depositing dielectric material in the gap.
2. The method of claim 1, wherein the protective liner is a silicon-containing film.
3. The method of claim 1, wherein the protective liner is an oxide, nitride, or carbide.
4. The method of claim 1, wherein the protective liner is etched during (a).
- 15 5. The method of claim 1, wherein the plasma during (a) is generated from nitrogen trifluoride (NF₃) and the protective liner is a silicon nitride film.
6. The method of claim 1, wherein the protective liner is between 10 and 999 Angstroms thick.
7. The method of claim 1, wherein depositing a protective liner and the performing one or more cycles are performed in the same chamber.
- 20 8. The method of claim 1, wherein the structure is a 3D NAND structure, the gap is formed by two stacks each comprising multiple pairs of an oxide layer and a nitride layer and capped by a polysilicon layer and wherein the protective liner protects the polysilicon layer.

9. The method of any of claims 1–8, wherein depositing the protective liner comprises a plasma enhanced atomic layer deposition (ALD) process.
10. The method of claim 9, wherein plasma power during the ALD process is lower than plasma power during (a).
- 5 11. The method of any of claims 1–8, wherein depositing the protective liner comprises a plasma enhanced chemical vapor deposition (PECVD) process.
12. The method of claim 11, wherein the protective liner is a silicon carbide liner deposited from silane.
13. A method comprising:
- 10 providing a substrate having structure including a gap to be filled, the gap lined with a protective liner that extends only partially into the gap; and
- performing one or more cycles of:
- (a) exposing the substrate to a plasma comprising halogen species to inhibit deposition on a portion of the gap;
- 15 (b) after (a), depositing dielectric material in the gap.
14. The method of claim 13, further comprising depositing a second protective liner that extends only partially into the gap during the one or more cycles.
15. The method of claim 13, wherein the plasma during (a) is generated from
- 20 nitrogen trifluoride (NF₃) and the protective liner is a silicon nitride film.
16. The method of claim 13, wherein the plasma during (a) is generated from nitrogen trifluoride (NF₃) and the protective liner is a silicon carbide film.

17. A method comprising:

providing a structure comprising a gap to be filled;

performing one or more inhibition blocks, each inhibition block comprising:

- 5 one or more growth cycles, each growth cycle comprising:
exposing the gap to a halogen-containing inhibition plasma and depositing
by atomic layer deposition a dielectric material in the gap;
- after the one or more growth cycles, exposing the structure to a
plasma generated from a hydrogen-containing gas;
- 10 after exposing the structure to the plasma generated from a
hydrogen-containing gas, exposing the structure to an oxidizing plasma.