What is claimed is:

1. A method of etching a film stack, the method comprising:

etching a film stack comprising alternating layers of an oxide and a nitride an having a first thickness to a depth of a second thickness to form a gap with a substantially uniform width, a sidewall and a bottom, the second thickness being less than the first thickness;

depositing a liner on the sidewall and the bottom of the gap;

etching the liner from the bottom of the gap;

selectively etching the film stack relative to the liner to a depth of a third thickness to extend a depth of the gap; and

removing the liner.

2. The method of claim 1, wherein the alternating layers have a thickness in a range of about 500 Å to about 3000 Å.

3. The method of claim 1, further comprising forming a patterned hardmask on the film stack before etching.

4. The method of claim 3, wherein openings in the patterned hardmask expose portions of the film stack to be etched.

5. The method of claim 4, wherein the openings have a width in a range of about 1 nm to about 100 nm.

6. The method of claim 1, wherein the liner comprises boron.

7. The method of claim 6, wherein the liner comprises one or more of B, BN, BC, or BCN.

8. The method of claim 1, wherein the liner is substantially conformal and deposited by atomic layer deposition.

9. The method of claim 1, wherein the liner has a thickness in a range of about 10 Å to about 50 Å.

10. The method of claim 1, wherein the liner is removed by a process comprising an anneal in an oxidizing atmosphere.

11. The method of claim 10, wherein the anneal is performed at a temperature greater than or equal to about 500 °C.

12. The method of claim 10, wherein the liner comprises carbon and the liner is removed by a process further comprising an oxygen plasma ash.

13. The method of claim 12, wherein the oxygen plasma ash is performed at a temperature in a range of about 300 °C to about 400 °C.

14. The method of claim 1, wherein each etch process is substantially directional.

15. A method of etching a film stack, the method comprising:

providing a substrate with a film stack of a first thickness formed thereon, the film stack comprising alternating layers of an oxide and a nitride;

forming a patterned hardmask on the film stack;

etching the film stack through the patterned hardmask to a depth of a second thickness to form a gap with a substantially uniform width, a sidewall and a bottom, the second thickness being less than the first thickness;

depositing a liner by atomic layer deposition on the sidewall and the bottom of the gap, the liner comprising boron and being conformal;

etching the liner from the bottom of the gap;

selectively etching the film stack relative to the liner to a depth of a third thickness to extend a depth of the gap; and

performing an anneal of the substrate under an oxidizing atmosphere to remove the liner.

16. The method of claim 15, wherein the substantially uniform width is in a rage of about 10 nm to about 100 nm.

17. The method of claim 15, wherein the liner has a thickness in a range of about 10 Å to about 50 Å.

18. The method of claim 15, wherein the anneal is performed at a temperature greater than or equal to about 500 °C.

19. A method of etching a film stack, the method comprising:

providing a substrate with a film stack formed thereon of a first thickness in a range of about 3000 nm to about 7000 nm, the film stack comprising alternating layers of an oxide and a nitride;

forming a patterned hardmask on the film stack with openings exposing the film stack, the openings having a width in a range of about 10 nm to about 100 nm;

etching the film stack through the patterned hardmask to a depth of a second thickness to form a gap with a substantially uniform width, a sidewall and a bottom, the second thickness being less than the first thickness;

depositing a liner by atomic layer deposition on the sidewall and the bottom of the gap, the liner comprising boron and carbon and being substantially conformal;

etching the liner from the bottom of the gap;

selectively etching the film stack relative to the liner to a depth of a third thickness to extend a depth of the gap; and

removing the liner by a process comprising:

performing an anneal under a steam atmosphere at a temperature greater than or equal to about 500 °C; and

performing an oxygen plasma ash at a temperature in a range of about 300 °C to about 400 °C.