What is claimed is:

1. A method for fabricating a 3D NAND flash memory having alternating layers of a first etching layer and a second etching layer on a substrate and a hardmask layer on the alternating layers, the method comprising the steps of:

forming a hardmask pattern on the hardmask layer; and

using the hardmask pattern to form apertures in the alternating layers by selectively plasma etching the alternating layers of the first etching layer and the second etching layer versus the hardmask layer in a plasma reaction chamber using a hydrofluorocarbon etching gas selected from the group consisting of trans-1,1,1,4,4,4-hexafluoro-2-butene; cis-1,1,1,4,4,4-hexafluoro-2-butene; hexafluoroisobutene (CAS No. 382-10-5); hexafluorocyclobutane (trans-1,1,2,2,3,4); pentafluorocyclobutane (1,1,2,2,3-); tetrafluorocyclobutane (1,1,2,2-); and hexafluorocyclobutane (cis-1,1,2,2,3,4);

wherein the first etching layer comprises a material different from that of the second etching layer

2. The method of claim 1, wherein the alternating layers comprises a layer of silicon oxide, silicon nitride, poly-Si, silicon oxynitride, silica, SiCOH, or combinations thereof.

3. The method of claim 1, wherein the first etching layer comprises a silicon oxide layer and the second etching layer comprises a silicon nitride layer, and vice versa.

4. The method of claim 1, wherein the hardmask layer is composed of carbon and metals.

5. The method of claim 4, wherein the alternating layers are selectively plasma etched from the hardmask layer composed of carbon and metals.

6. The method of claim 1, wherein the hydrofluorocarbon etching gas is trans-1,1,1,4,4,4-hexafluoro-2-butene.

7. The method of claim 1, wherein the hydrofluorocarbon etching gas is hexafluoroisobutene.

8. The method of any one of claims 1 to 7, wherein the hydrofluorocarbon etching gas plasma etches the alternating layers of the first etching layer and the second etching layer versus the hardmask layer with an improved selectivity.

9. The method of any one of claims 1 to 7, wherein the apertures have an aspect ratio between approximately 10:1 and approximately 100:1.

10. The method of any one of claims 1 to 7, further comprising introducing an oxidizer into the plasma reaction chamber.

11. The method of claim 10, wherein the oxygen-containing gas is selected from the group consisting of O_2, O_3, CO, CO_2, NO, N_2O, NO_2 and combinations thereof.

12. The method of any one of claims 1 to 7, further comprising introducing an inert gas into the plasma reaction chamber.

13. The method of any one of claims 1 to 7, further comprising introducing a second etch gas, wherein the second etch gas is selected from the group consisting of cC_4F_8, C_4F_8, cC_5F_8, C_4F_6, CF_4, CHF_3, CFH_3, CH_2F_2, COS, CS_2, CF_3I, C_2F_3I, C_2F_5I, and SO_2.

14. A method for fabricating a 3D NAND flash memory having alternating layers of a first etching layer and a second etching layer on a substrate and a hardmask layer on the alternating layers, the method comprising the steps of:

forming a hardmask pattern on the hardmask layer; and

using the hardmask pattern to form apertures in the alternating layers by selectively plasma etching the alternating layers of the first etching layer and the second etching layer versus the hardmask layer using an etching gas trans-1,1,1,4,4,4-hexafluoro-2-butene,

wherein the first etching layer comprises a material different from that of the second etching layer.

15. A method for fabricating a 3D NAND flash memory having alternating layers of a first etching layer and a second etching layer on a substrate and a hardmask layer on the alternating layers, the method comprising the steps of:

forming a hardmask pattern on the hardmask layer; and

using the hardmask pattern to form apertures in the alternating layers by selectively plasma etching the alternating layers of the first etching layer and the second etching layer versus the hardmask layer using an etching gas hexafluoroisobutene,

wherein the first etching layer comprises a material different from that of the second etching layer.