CLAIMS

1. A method of processing a wafer used in fabricating semiconductor devices, said method comprising:

forming high aspect ratio features in a silicon based layer on the wafer, wherein the high aspect ratio features are formed utilizing a dry etching process;

making sidewalls of the high aspect ratio features more hydrophobic without needing to wet the high aspect ratio features before the making the sidewalls of the high aspect ratio features more hydrophobic, wherein the sidewalls of the high aspect ratio features are made more hydrophobic prior to performing wet processing of the high aspect ratio features of the wafer;

performing wet processing of the high aspect ratio features of the wafer; and

subsequently drying the wafer.

2. The method of claim 1, wherein the making the sidewalls of the high aspect ratio features more hydrophobic is accomplished by depositing a primer on the wafer, wherein the primer makes the sidewalls more hydrophobic by chemically altering the surface of the high aspect ratio features.

3. The method of claim 2, wherein the primer is deposited on the wafer by way of vapor deposition.

4. The method of claim 3, wherein the depositing of the primer on the wafer prior to the wet processing comprises:

generating a primer solution by mixing a solution of 0.1-50% by weight of $C_8F_{13}H_4SiCl_3$ (FOTS) in anhydrous n-hexane; and

co-heating a portion of the primer solution with the wafer such that the primer solution evaporates and the FOTS molecule reacts with the sidewalls of the-features.

5. The method of claim 2, wherein the primer comprises a self-assembled monolayer.

6. The method of claim 2, wherein the primer comprises a film, and wherein the film comprises at least one of: hexamethyldisiloxane, an alkoxysilane or an alkylsilane.

7. The method of claim 1, wherein the making the sidewalls more hydrophobic is accomplished by roughening the sidewalls.

8. The method of claim 7, wherein the roughening of the sidewalls is accomplished by way of exposing the wafer to at least of: polymerizing plasma, hydrogen fluoride vapor or fluoride based plasma etch.

9. The method of claim 7, wherein the roughening of the sidewalls is accomplished by reactive-ion etching.

10. The method of claim 1, wherein forming of the high aspect ratio features comprises:

forming a photoresist patterned mask over the silicon based layer; and

etching the high aspect ratio features into the silicon based layer.

11. The method of claim 10, wherein the forming the high aspect ratio features further comprises stripping the photoresist patterned mask.

CLAIMS

What is claimed is:

1. A method of processing a wafer used in fabricating semiconductor devices, said method comprising:

forming high aspect ratio features in a silicon based layer on the wafer;

making sidewalls of the features more hydrophobic;

performing wet processing of the wafer; and

subsequently drying the wafer.

2. The method of claim 1, wherein the making the sidewalls of the features more hydrophobic is accomplished by depositing a primer on the wafer, wherein the primer makes the sidewalls more hydrophobic by chemically altering the surface of the features.

3. The method of claim 2, wherein the primer is deposited on the wafer by way of vapor deposition prior to the performing wet processing of the wafer.

4. The method of claim 3, wherein the depositing of the primer on the wafer prior to the wet processing comprises:

generating a primer solution by mixing a solution of 0.1-50% by weight of $C_8F_{13}H_4SiCl_3$ (FOTS) with anhydrous n-hexane; and

co-heating a portion of the primer solution with the wafer such that the primer solution evaporates and the FOTS molecule reacts with the sidewalls of the nanostructures.

5. The method of claim 2, wherein the primer is deposited on the wafer by way of liquid deposition during the wet processing of the wafer.

6. The method of claim 5, wherein the performing wet processing of the wafer includes rinsing the wafer subsequent to the depositing the primer on the wafer during the wet processing.

7. The method of claim 2, wherein the primer comprises a self-assembled monolayer.

8. The method of claim 2, wherein the primer comprises a film, and wherein the film comprises at least one of: hexamethyldisiloxane, an alkoxysilane or an alkysilane.

9. The method of claim 1, wherein the making the sidewalls more hydrophobic is accomplished by roughening the sidewalls.

10. The method of claim 9, wherein the roughening of the sidewalls is accomplished by way of exposing the wafer to at least one of: polymerizing plasma, hydrogen fluoride vapor or fluoride based plasma etch.

11. The method of claim 9, wherein the roughening of the sidewalls is accomplished by reactive-ion etching.

12. The method of any of claims 1-11, wherein the forming the high aspect ratio features comprises:

forming a photoresist patterned mask over the silicon based layer; and

etching the high aspect ratio features into the silicon based layer.

13. The method of claim 12, wherein the forming the high aspect ratio features further comprises stripping the photoresist patterned mask.

14. A method of processing a wafer used in fabricating semiconductor devices, said method comprising:

forming high aspect ratio features in a silicon based layer on the wafer;

performing a wet processing of the wafer, wherein the wet processing comprises:

wet cleaning the wafer;

depositing a primer on the wafer that modifies surface properties of the features so as to increase the hydrophobicity of the surfaces of the features; and

replacing organic solvent used in primer deposition with DI water; and subsequently drying the wafer

15. The method of claim 14, wherein the primer comprises a self-assembled monolayer.

16. The method of claim 14, wherein the primer comprises a film, and wherein the film comprises at least one of: hexamethyldisiloxane, an alkoxysilane or an alkysilane.

17. The method of claim 14 wherein the depositing the primer on the wafer comprises:

immersing the wafer in a solution of 0.01-50% by weight $C_8F_{13}H_4SiCl_3$ (FOTS) in at least one of HFE, Toluene, n-hexane, chloroform or acetone, under a nitrogen atmosphere; and

rinsing with HFE;

18. The method of any of claims14 -17 wherein the replacing of organic solvent comprises:

rinsing the wafer with an organic solvent miscible with water; and

rinsing the wafer with DI water.

19. The method of any of claims 14-18 wherein a solution used in the wet cleaning of the wafer comprises one or more of: HCl, HF, NH_4F, NH_3 aqueous solution, H_2SO_4 or H_2O_2.