~~AMENDED~~ CLAIMS

What is claimed is:

1. A method for providing a tuned repair for damage to a silicon based low-k dielectric layer with organic compounds, where damage replaces a methyl attached to silicon with a hydroxyl attached to silicon, comprising:

providing a precursor gas, comprising:

a first repair agent represented as $Si\text{-}(R)_x(OR')_y$, where $y \geq 1$ and $x+y=4$, and wherein R is an alkyl or aryl group and R' is an alkyl or aryl group; and

a second repair agent represented as $Si\text{-}(R)_x(OR')_yR''$, where $y \geq 1$ and $x+y=3$, and wherein R is an alkyl or aryl group and R' is an alkyl or aryl group, and R" is of a group that reduces interfacial surface tension between a wet clean chemical and the low-k dielectric ~~layer~~; and

bonding some of the first repair agent and second repair agent to the low-k dielectric ~~layer~~ to form a monolayer of the first repair agent and the second repair agent.

2. The method, as recited in claim 1, wherein R" is an amino group, a phenyl group, cyano group, chloro group, thiol group, epoxy group, vinyl group, or cyclic azasiline group.

3. The method, as recited in claim 2, wherein a photoresist mask is formed over the silicon based low-k dielectric layer and further comprising stripping the photoresist mask after bonding some of the first repair agent and second repair agent to the low-k dielectric to form a monolayer of the first repair agent and the second repair agent.

4. The method, as recited in claim 2, wherein a photoresist mask is formed over the silicon based low-k layer and further comprising stripping the photoresist mask before providing ~~the~~ a precursor gas.

5. The method, as recited in claim 4, further comprising etching features in the silicon based low-k dielectric layer after the photoresist mask is formed and before stripping the photoresist mask.

6. The method, as recited in claim 1, wherein the bonding comprises providing a ~~catalyst~~ precursor gas comprising a Lewis base gas.

7. The method, as recited in claim 6, wherein the bonding further comprises providing a plasma free environment.

~~8. A method for providing a tuned repair for damage to a silicon based low-k dielectric layer with organic compounds, where damage replaces a methyl attached to silicon with a hydroxyl attached to silicon, comprising:~~

~~forming a repair layer on a surface of the damaged silicon based low-k dielectric layer, which replaces silanol (Si-OH) bonds with Si-C or CH_3 bonds; and~~

~~exposing the repair layer to a plasma, which replaces some CH_3 moieties with OH moieties.~~

~~9. The method, as recited in claim 8, wherein the plasma provides ion bombardment or UV or VUV radiation.~~

~~10. The method, as recited in claim 9, wherein the exposing the repair layer, comprises:~~

~~providing a tuning gas, which consists essentially of an inert gas and/or O_2; and~~

~~forming the tuning gas into the plasma.~~

~~11. The method, as recited in claim 10, wherein the tuning gas consists essentially of an inert gas.~~

~~12. The method, as recited in claim 8, wherein the forming the repair layer, comprises:~~

~~providing a mixture gas, comprising:~~

~~a catalyst gas comprising a Lewis base gas; and~~

~~a alkoxysilane containing gas; and~~

~~binding a monolayer of an alkoxysilane on the silicon based low-k dielectric layer.~~

~~13. The method, as recited in claim 12, wherein the Lewis base gas is an amine gas.~~

~~14. The method, as recited in claim 13, wherein during the providing the mixture gas a wafer temperature is kept below 60° C.~~

~~15. The method, as recited in claim 8, wherein the exposing the repair layer, comprises:~~

~~providing a tuning gas, which consists essentially of an inert gas and/or O_2; and~~

~~forming the tuning gas into the plasma.~~

~~16~~8. A method for repairing damage to a silicon based low-k dielectric layer with organic compounds, where damage replaces a methyl attached to silicon with a hydroxyl attached to silicon, comprising:

etching the silicon based low-k dielectric layer through a photoresist mask;

providing a mixture gas, comprising:

a catalyst gas comprising a Lewis base gas; and

a alkoxysilane containing gas; and

binding a monolayer of an alkoxysilane on the silicon based low-k dielectric layer; and

stripping ~~a~~ the photoresist mask after binding the monolayer.

~~17~~9. The method of claim ~~16~~ 8, wherein the binding the monolayer comprises, providing conditions to cause a Lewis base to physiosorb to a hydroxyl attached to silicon and to cause silicon of the alkoxysilane to bond with oxygen of the hydroxyl.

~~18~~10. The method, as recited in claim ~~17~~ 9, wherein the Lewis base gas is an amine gas.

~~19~~11. The method, as recited in claim ~~18~~ 10, wherein the during the providing the mixture gas a wafer temperature is kept below 60° C.

~~20~~12. The method, as recited in claim ~~19~~ 11, wherein a vacuum is maintained from before the etching until after binding the monolayer.

~~21. The method, as recited in any of claims 1-2, wherein a photoresist mask is formed over the silicon based low-k dielectric layer and further comprising stripping the photoresist mask after bonding some of the first repair agent and second repair agent to the low-k dielectric to form a monolayer of the first repair agent and the second repair agent.~~

~~22. The method, as recited in any of claims 1-2, wherein a photoresist mask is formed over the silicon based low-k layer and further comprising stripping the photoresist mask before providing the precursor gas.~~

~~23. The method, as recited in any of claims 1-2 and 21-22, further comprising etching features in the silicon based low-k dielectric layer after the photoresist mask is formed and before stripping the photoresist mask.~~

~~24. The method, as recited in any of claims 1-2 and 21-23, wherein the bonding comprises providing a catalyst gas comprising a Lewis base gas.~~

~~25. The method, as recited in claim 24, wherein the bonding further comprises providing a plasma free environment.~~

~~26. The method, as recited in any of claims 8-9, wherein the exposing the repair layer, comprises:~~

~~providing a tuning gas, which consists essentially of an inert gas and/or O_2; and~~

~~forming the tuning gas into the plasma.~~

~~27. The method, as recited in claim 26, wherein the tuning gas consists essentially of an inert gas.~~

~~28. The method, as recited in any of claims 8-9 and 26-27, wherein the forming the repair layer, comprises:~~

~~providing a mixture gas, comprising:~~

~~a catalyst gas comprising a Lewis base gas; and~~

a alkoxysilane containing gas; and

binding a monolayer of an alkoxysilane on the silicon based low-k dielectric layer.

29. The method, as recited in claim 28, wherein the Lewis base gas is an amine gas.

30. The method, as recited in any of claims 28-29, wherein during the providing the mixture gas a wafer temperature is kept below 60° C.

31. The method, as recited in any of claims 16-18, wherein the during the providing the mixture gas a wafer temperature is kept below 60° C.

32. The method, as recited in any of claims 16-19 and 31, further comprising etching the silicon based low-k dielectric layer through the photoresist mask before stripping the photoresist mask and wherein a vacuum is maintained from before the etching until after binding the monolayer.