~~What is claimed is:~~

CLAIMS:

1. A method of forming a device comprising:

providing a structure having first and second regions; and

forming a diffusion barrier between at least a portion of the first and second regions, wherein the diffusion barrier comprises cavities which reduces diffusion of elements between the first and second regions.

2. The method of claim 1 wherein providing the structure comprises providing a substrate having a plurality of shallow trench isolation (STI) regions.

3. The method of claim 1 comprises forming a gate electrode layer over the structure wherein the diffusion barrier is formed in the gate electrode layer.

4. The method of claim 3 wherein forming the diffusion barrier comprises:

providing a mask on top of the structure, the mask shields at least the portion of the first and second regions;

implanting dopants in regions not covered by the mask to form an implant region; and

annealing the implant region to form the cavities.

5. The method of claim 4 wherein providing the mask comprises forming the mask directly on the structure.

6. The method of claim 1 wherein the first region is doped with first type dopants and the second region is doped with second type dopants.

7. The method of claim 6 wherein the first type dopants are n type dopants and the second type dopants are p type dopants or vice versa.

8. The method of claim 1 wherein the first region is a source and/or drain region and the second region is a substrate region away from the device.

9. The method of claim 8 wherein providing the structure comprises providing a substrate having a plurality of shallow trench isolation (STI) regions and the diffusion barrier spans a substantial distance from one STI region to another adjacent STI region.

10. The method of claim 8 wherein providing the structure comprises providing a substrate having a plurality of shallow trench isolation (STI) regions and the diffusion barrier spans a full distance from one STI region to another adjacent STI region.

11. The method of claim 8 wherein the device is a field effect transistor (FET).

12. The method of claim 1 wherein forming the diffusion barrier comprises:

providing a mask on top of the structure, the mask comprises a cavity that exposes a portion of a top surface of the structure of which a gate structure is to be formed;

implanting dopants in the portion exposed by the cavity to form an implant region below a portion of the structure which forms a channel region of the device; and

annealing the implant region to form the cavities.

13. The method of claim 12 wherein the first region is a source region and the second region is a drain region.

14. A method of forming a semiconductor device comprising:

providing a substrate prepared with first and second regions; and

forming a diffusion barrier between at least a portion of the first and second regions, wherein the diffusion barrier comprises cavities which reduces diffusion of elements between the first and second regions.

15. The method of claim 14 comprises:

implanting dopants forming an implant region of which the diffusion barrier is to be formed; and

annealing the implant region to form the cavities.

16. The method of claim 15 wherein implanting dopants is performed after providing a mask on top of the substrate, the mask comprises a cavity that exposes a portion of a top surface of the substrate of which a gate structure of the semiconductor device is to be formed.

17. The method of claim 1 wherein the substrate comprises a plurality of STI regions.

18. A device comprising:

a structure having first and second regions; and

a diffusion barrier disposed between at least a portion of the first and second regions, wherein the diffusion barrier comprises cavities which reduces diffusion of elements between the first and second regions.

19. The device of claim 18 wherein the first region is doped with first type dopants and the second region is doped with second type dopants.

20. The method of claim 19 wherein the first type dopants are n type dopants and the second type dopants are p type dopants or vice versa.

What is claimed is:

CLAIMS

1. A method of forming a device comprising:

providing a structure having first and second regions, wherein providing the structure comprises forming a gate electrode layer on a substrate;

forming a diffusion barrier between at least a portion of the first and second regions, wherein the diffusion barrier comprises cavities which reduce diffusion of elements between the first and second regions, and the diffusion barrier is formed in the gate electrode layer.

2. The method of claim 1 wherein forming the diffusion barrier comprises:

providing a mask on top of the structure, the mask shields at least the portion of the first and second regions;

implanting dopants in regions not covered by the mask to form an implant region; and

annealing the implant region to form the cavities.

3. The method of claim 2 wherein providing the mask comprises forming the mask directly on the structure.

4. A method of forming a device comprising:

providing a structure having first and second regions, wherein the structure comprises a gate electrode layer on a substrate; and

forming a diffusion barrier in the gate electrode layer between at least first and second regions of the gate electrode layer, wherein the diffusion barrier comprises cavities which reduce diffusion of elements between the first and second regions.

5. The method of claim 4 wherein forming the diffusion barrier comprises:

providing a mask on top of the structure, the mask shields at least the portion of the first and second regions;

implanting dopants in regions not covered by the mask to form an implant region; and

annealing the implant region to form the cavities.

6. The method of claim 5 wherein providing the mask comprises forming the mask directly on the structure.

7. The method of claim 4 wherein the first and second regions of the gate electrode layer is disposed along a length of the gate electrode layer.