Claims

1. A method for forming a silicon germanium layer, comprising:

depositing a seed silicon germanium layer over complementary metal-oxide semiconductor (CMOS) on a substrate using plasma enhanced chemical vapor deposition (PECVD), wherein the substrate has a first predetermined temperature during processing, wherein the PECVD for depositing the seed silicon germanium layer has an RF power between 300 W and 600 W; and

depositing a bulk silicon germanium layer directly on the seed silicon germanium layer using PECVD, wherein the substrate has a second predetermined temperature during processing, wherein the PECVD for depositing the bulk silicon germanium layer has an RF power between 600 W and 800 W.

~~2. The method of claim 1, wherein the substrate includes a complementary metal-oxide semiconductor (CMOS) structure and the seed silicon germanium layer is deposited over the CMOS structure.~~

~~3~~2. The method of claim 1, wherein the PECVD for depositing the seed silicon germanium layer has a process pressure between 3 Torr and 4.2 Torr.

~~4.~~3. The method of claim 1, wherein the PECVD for depositing the bulk silicon germanium layer has a process pressure between 3 Torr and 4.2 Torr.

~~5~~4. The method of claim 1, further comprising flowing a gas mixture during the depositing of the seed silicon germanium layer, wherein the gas mixture comprises

a silicon containing gas, a germanium containing gas, a boron containing gas and a hydrogen gas.

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5. The method of claim ~~5, wherein the silicon containing gas is silane.~~

~~7. The method of claim 5, wherein the germanium containing gas is germane.~~

~~8. The method of claim 5~~4, wherein the boron containing gas is diborane.

~~9.~~6. The method of claim ~~5~~4, wherein the silicon containing gas has a flow rate between 0.064 sccm/cm^2 and 0.085 sccm/cm^2.

~~10.~~7. The method of claim ~~5~~4, wherein the germanium containing gas has a flow rate between 0.354 sccm/cm^2 and 0.476 sccm/cm^2.

~~11.~~8. The method of claim ~~5~~4, wherein the boron containing gas has a flow rate between 0.064 sccm/cm^2 and 0.085 sccm/cm^2.

~~12.~~9. The method of claim ~~5~~4, wherein the hydrogen gas has a flow rate between 5.941 sccm/cm^2 and 7.779 sccm/cm^2.

~~13.~~10. A method for forming a silicon germanium layer, comprising:

depositing a seed silicon germanium layer over complementary metal-oxide semiconductor (CMOS) on a substrate using plasma enhanced chemical vapor

deposition (PECVD), wherein the substrate has a first predetermined temperature during processing, wherein the PECVD for depositing the seed silicon germanium layer has an RF power between 300 W and 600 W; and

depositing a bulk silicon germanium layer directly on the seed silicon germanium layer using PECVD, wherein the substrate has a second predetermined temperature and a gas mixture is introduced during the depositing of the bulk silicon germanium layer, and wherein the gas mixture comprises a silicon containing gas, a germanium containing gas, a boron containing gas and a hydrogen gas, and wherein the PECVD for depositing the bulk silicon germanium layer has an RF power between 600 W and 800 W.

~~14.~~11. The method of claim ~~13~~10, wherein the silicon containing gas has a flow rate between 0.141 sccm and 0.282 sccm/cm^2.

~~15.~~12. The method of claim ~~13~~10, wherein the germanium containing gas has a flow rate between 1.160 sccm/cm^2 to 1.414 sccm/cm^2.

~~16.~~13. The method of claim ~~13~~10, wherein the boron containing gas has a flow rate between 0.113 sccm/cm^2 and 0.212 sccm/cm^2.

~~17.~~14. The method of claim ~~13~~10, wherein the hydrogen gas has a flow rate between 6.365 sccm/cm^2 and 7.779 sccm/cm^2.

~~18. The method of claim 13, wherein the silicon containing gas is silane.~~