Claims

1. A method for forming a silicon nitride or silicon carbonitride film on at least one surface of a substrate by a deposition process selected from a chemical vapor deposition process and an atomic layer deposition process, the method comprising:

providing the at least one surface of the substrate in a reactor;

introducing at least one halidosilane precursor selected from the group consisting of monochlorodisilane (MCDS), and monochlorotrisilane (MCTS), and

introducing a nitrogen-containing source into the reactor wherein the at least one silicon containing precursor and the nitrogen-containing source react to form the silicon nitride on the at least one surface.

2. The method of claim 1 wherein the nitrogen-containing source is selected from the group consisting of ammonia, hydrazine, monoalkylhydrazine, dialkylhydrazine, organoamine, organodiamine, ammonia plasma, hydrazine plasma, nitrogen plasma, nitrogen/hydrogen plasma, organoamine plasma, organodiamine plasma and mixtures thereof.
3. The method of claim 2 wherein the plasma is generated in situ.
4. The method of claim 2 wherein the plasma is generated remotely.
5. The method of any one of claims 1 to 4 wherein the silicon nitride film is selected from the group consisting of silicon nitride and silicon carbonitride.
6. The method of of any one of claims 1 to 5 further comprising introducing a metal containing precursor into the reactor to deposit a metal doped silicon nitride film.
7. The method of claim 6 wherein the metal containing precursor is selected from the group consisting of aluminum chloride ($AlCl_3$), trimethylaluminum, triethylaluminum, tris(dimethylamino)aluminum, tris(diethylamino)aluminum, boron chloride (BCl_3), trimethylborane, trimethylborone, triethylborane, tris(dimethylamino)borane, tris(diethylamino)borane, gallium chloride ($GaCl_3$), trimethylgallium, trimethylgallium, triethylgallium, tris(dimethylamino)gallium, tris(diethylamino)gallium.

8. A method for forming a silicon film on at least one surface of a substrate by a deposition process selected from a chemical vapor deposition process and an atomic layer deposition process, the method comprising:

providing the at least one surface of the substrate in a reactor;

introducing at least one halidosilane precursor comprising at least one member selected from the group consisting of monochlorodisilane (MCDS), and monochlorotrisilane (MCTS), and

optionally introducing a hydrogen-containing source into the reactor wherein the at least one silicon containing precursor and the hydrogen-containing source react to form the silicon film on the at least one surface.

9. The method of claim 8 wherein the hydrogen-containing source is selected from the group consisting of hydrogen plasma, hydrogen/argon plasma, hydrogen/helium plasma, hydrogen, hydrogen/argon, hydrogen/helium, hydrogen/hydrogen chloride, hydrogen chloride, and mixtures thereof.
10. The method of claim 9 wherein the plasma is generated in situ.
11. The method of claim 9 wherein the plasma is generated remotely.
12. The method of any one of claims 8 to 11 wherein the silicon film is selected from the group consisting of amorphous silicon, polycrystal silicon, microcrystal silicon, boron doped silicon, germanium doped silicon.