We claim:

1. A N-H free, C-free, and Si-rich perhydropolysilazane composition comprising N-H free repeating units having the formula [-N(SiH_3)$_x$(SiH_2-)$_y$], wherein x=0, 1, or 2 and y= 0, 1, or 2 with x+y=2 ; and x= 0, 1 or 2 and y=1, 2, or 3 with x+y=3; the N-H free, C-free, and Si-rich perhydropolysilazane composition being a liquid at standard temperature and pressure..

2. The N-H free, C-free, and Si-rich perhydropolysilazane composition of claim 1, the composition having a Si:N ratio ranging from 1.5:1 to 2.5:1.

3. The N-H free, C-free, and Si-rich perhydropolysilazane composition of claim 1, the composition having no –Si(-)(H)- and a SiH_2:SiH_3 ratio ranging from 1 to 5, preferably from 3.5 to 4.5.

4. A spin-on Si-containing film forming composition comprising a N-H free, C-free, and Si-rich perhydropolysilazane having N-H free repeating units having the formula [-N(SiH_3)$_x$(SiH_2-)$_y$], wherein x=0, 1, or 2 and y= 0, 1, or 2 with x+y=2 ; and x= 0, 1 or 2 and y=1, 2, or 3 with x+y=3, the spin-on Si-containing film forming composition being a liquid at standard temperature and pressure; and wherein the N-H free, C-free, and Si-rich perhydropolysilazane has no –Si(-)(H)- and a SiH_2:SiH_3 ratio ranging from 1 to 5, preferably from 3.5 to 4.5.

5. The spin-on Si-containing film forming composition of claim 4, the N-H free, C-free, and Si-rich perhydropolysilazane composition having a Si:N ratio ranging from 1.5:1 to 2.5:1.

6. The spin-on Si-containing film forming composition of claim 5 further comprising a solvent or a solvent system.

7. The spin-on Si-containing film forming composition of claim 6, wherein the solvent or the solvent system comprises hydrocarbons, ketones, ethers, amines, esters, or combinations thereof.

8. The spin-on Si-containing film forming composition of claim 6, wherein the solvent or the solvent system comprises benzene, toluene, xylene, n-hexane, mesitylene, methylethylketone, cyclohexanone, 2-heptanone, ethyl ether, tetrahydrofuran, pyridine, xylene, methyl pyridine, 2-hydroxy ethyl propionate, hydroxyl ethyl acetate, or combinations thereof.

9. A method of forming a Si-containing film on a substrate, the method comprising contacting the spin-on Si-containing film forming composition of any one of claims 4 to 8 with the substrate via a spin coating, spray coating, dip coating, or slit coating technique to form the Si-containing film.

10. The method of claim 9, wherein the substrate comprises trenches having an aspect ratio ranging from 1:1 to 1:100.

11. The method of claim 10, wherein the trenches have a critical dimension ranging from 10 nm to 1 micron.

12. The method of any one of claims 9 to 11, wherein the Si-containing film is SiO_2 having a wet etch rate ranging from 1 to 5 as compared to thermal oxide grown at 1100°C, preferably ranging from 1 to 3.