excess precursor. A 16-second plasma O_2 pulse was followed by a 3-second N_2 purge. The process was repeated until a minimum thickness of 300 Angstrom was obtained. Depositions were performed with the substrate heated to 70°C, 150°C, and 300°C. Real self limited ALD growth behavior was validated as shown in **FIG 4** by increasing the number of precursor pulses within a given cycle.

[00118] ALD tests were also performed using the prior art $SiH_2(NEt_2)_2$ precursor as the Si-containing film forming composition **10**, which was placed in an ampoule heated to 60°C and O_2 plasma as oxidizing reactant. Applicants believe that $SiH_2(NEt_2)_2$ is currently used to deposit SiO_2 in several commercial processes. Typical ALD conditions were used with the reactor pressure fixed at ~9 hPa (1 hPa=100 Pa=1mbar). Two 0.1-second pulses of the precursor vapor were introduced into the deposition chamber via overpressure in the ampoule using the 3-way pneumatic valve. The 0.1-second pulses were separated by a 0.5 second pause. A 4-second N_2 purge removed any excess precursor. A 16-second plasma O_2 pulse was followed by a 3-second N_2 purge. The process was repeated until a minimum thickness of 300 Ang was reached. Depositions were performed at 70°C, 150°C, 200°C, and 300°C. As shown in **FIG 5**, the growth per cycle decreased with increasing temperature.

Table 2 summarizes the results:

	$SiH_2(NEt_2)_2$	$(SiH_3)_2N\text{-}SiH_2\text{-}NiPr_2$
Growth rate 70°C[1]	1.42 Ang/cycle	3.10 Ang/cycle
Growth rate 300°C[1]	0.98 Ang/cycle	2.05 Ang/cycle
Wet Etch Rate 70°C[2]	9.4 Ang/sec	8.8 Ang/sec
Wet Etch Rate 150°C[2]	7.2 Ang/sec	6.7 Ang/sec
Wet Etch Rate 300°C[2]	6.6 Ang/sec	6.7 Ang/sec
Refractive Index 70°C[3]	1.432	1.460
Atomic % Carbon 70°C[4]	0.05%	TBD
Atomic % Carbon 150°C[4]	0.045%	0,015-0,03%
Atomic % Hydrogen 150°C[4]	~10%	~10%
Atomic % Nitrogen 150°C[4]	0.015%	0,1%
Within Wafer Non Uniformity[5]	2.84%	2.90%

[1] Growth rate for films deposited at the stated temperatures

[2] Wet Etch Rate for films deposited at the stated temperatures

What is claimed is:

1. A Si-containing film forming composition comprising a mono-substituted TSA precursor having the formula:

$$(SiH_3)_2N\text{-}SiH_2\text{-}X$$

wherein X is selected from a halogen atom selected from Cl, Br or I; an isocyanato group [–NCO]; an amino group [$–NR^1R^2$]; an N-containing C_4-C_{10} saturated or unsaturated heterocycle; or an alkoxy group [–O–R]; R^1, R^2 and R each is selected from H; a C_1-C_6 linear or branched, saturated or unsaturated hydrocarbyl group; or a silyl group [SiR'_3] with each R' being independently selected from H; a halogen atom selected from Cl, Br or I; a C_1-C_4 saturated or unsaturated hydrocarbyl group; a C_1-C_4 saturated or unsaturated alkoxy group; or an amino group [$–NR^3R^4$] with each R^3 and R^4 being selected from H or a C_1-C_6 linear or branched, saturated or unsaturated hydrocarbyl group; provided that if R^1 = H, then $R^2 \neq$ H or Me.

2. The Si-containing film forming composition of claim 1, wherein X = Cl.

3. The Si-containing film forming composition of claim 1, wherein X= NR^1R^2 and R^1 and R^2 each is independently selected from H, Me, Et, or iPr.

4. The Si-containing film forming composition of claim 3, wherein the mono-substituted TSA precursor is $(SiH_3)_2N\text{-}SiH_2\text{-}NiPr_2$.

5. The Si-containing film forming composition of claim 3, wherein the mono-substituted TSA precursor is $(SiH_3)_2N\text{-}SiH_2\text{-}NEt_2$.

6. The Si-containing film forming composition of claim 3, wherein the mono-substituted TSA precursor is $(SiH_3)_2N\text{-}SiH_2\text{-}NHiPr$.

7. The Si-containing film forming composition of claim 1, wherein X = $–N(SiR_3)_2$, and each R is independently selected from a halogen, H, or a C_1-C_4 alkyl group.

8. The Si-containing film forming composition of claim 7, wherein the mono-substituted TSA precursor is $(SiH_3)_2N\text{-}SiH_2\text{-}N(SiH_3)_2$.

reacting the mono-substituted TSA precursor with the oxidized silicon-containing layer to form a silicon-rich oxidized silicon-containing layer by introducing the mono-substituted TSA precursor into the reactor;

reacting a nitrogen-containing reactant with the silicon-containing layer to form the nitrogen-doped silicon oxide film by introducing the nitrogen-containing reactant into the reactor.

16. The nitrogen-doped silicon oxide film of claim 15, further comprising purging the reactor with an inert gas between each introduction step.