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(54) Title: 1-METHYL-1-ISO-PROPOXY-SILACYCLOALKANES AND DENSE ORGANOSILICA FILMS MADE THEREFROM

AA										BB									
Variable Parameters										Fixed Parameters									
Power = 215 - 415 W										Temp = 400 °C									
MIPSCP = 2.0 - 3.3 g/min										Spacing = 380 mils									
O ₂ = 25 - 125 sccm										He Carrier = 1500 sccm									
										Pressure = 7.5 Torr									
DOE Run #	Power (Watts)	O ₂ (sccm)	MIPSCP (mg/min)	Deposition Rate (nm/min)	RI (832 nm)	AD NU (%)	k	Elastic Modulus (GPa)	Hardness (GPa)	XPS Carbon (%)	Si(CH ₃) ₂ SiO ₂ *12	Si(CH ₃) ₂ SiO ₂ *13	Si(CH ₃) ₂ SiO ₂ *14	Si(CH ₃) ₂ SiO ₂ *15	Si(CH ₃) ₂ SiO ₂ *16	Si(CH ₃) ₂ SiO ₂ *17	Si(CH ₃) ₂ SiO ₂ *18	Si(CH ₃) ₂ SiO ₂ *19	Si(CH ₃) ₂ SiO ₂ *20
1	315	75	2650	49	1.407	1.7	2.90	12	1.7	18	2.9	23.5	3.6	13%	6	1.9			
2	315	75	2650	49	1.407	1.6	2.90	12	1.7	18	2.9	23.5	3.6	13%	6	1.9			
3	315	75	2650	48	1.407	1.6	2.91	12	1.7	18	2.9	23.6	3.6	13%	6	1.9			
4	415	125	3300	73	1.398	1.7	2.88	11	1.5	17	3.1	25.0	3.6	12%	5	1.9			
5	415	125	2000	101	1.419	2.2	2.99	15	2.1	17	2.4	20.0	2.9	13%	6	1.7			
6	415	25	3300	59	1.458	1.7	2.91	13	1.8	29	2.9	16.5	10.5	39%	17	3.5			
7	415	25	2000	80	1.488	2.7	3.05	17	2.3	31	2.6	13.9	10.7	44%	19	3.7			
8	215	125	3300	24	1.374	3.3	3.13	11	1.5	12	2.7	24.2	1.1	4.4%	1	1.1			
9	215	125	2000	36	1.381	1.9	3.20	13	1.8	12	2.5	22.7	1.0	4.3%	3	1.1			
10	215	25	3300	17	1.410	2.3	2.87	11	1.6	20	2.9	23.3	4.3	16%	9	2.0			
11	215	25	2000	28	1.427	2.3	2.92	13	1.8	21	2.7	20.5	4.7	19%	12	1.9			
12	415	75	2650	83	1.425	2.1	2.92	13	1.8	22	2.8	20.8	5.1	20%	10	2.4			
13	215	75	2650	25	1.390	1.4	2.91	11	1.6	14	2.9	25.3	2.1	7.7%	5	1.4			
14	315	125	2650	52	1.392	1.4	2.93	12	1.6	15	2.9	25.0	2.2	8.0%	6	1.5			
15	315	25	2650	41	1.443	2.1	2.92	14	1.7	25	2.8	18.8	7.3	28%	17	2.8			
16	315	75	3300	40	1.400	1.4	2.82	11	1.6	17	3.0	24.8	3.5	12%	6	1.9			
17	315	75	2000	62	1.420	2.2	2.95	14	2.0	18	2.6	21.4	3.3	13%	7	1.9			

FIG. 1

(57) Abstract: A method for making a dense organosilicon film with improved mechanical properties, the method comprising the steps of: providing a substrate within a reaction chamber; introducing into the reaction chamber a gaseous composition comprising 1-methyl-1-iso-propoxy-silacyclopentane or 1-methyl-1-iso-propoxy-silacyclobutane; and applying energy to the gaseous composition comprising 1-methyl-1-iso-propoxy-silacyclopentane or 1-methyl-1-iso-propoxy-silacyclobutane in the reaction chamber to induce reaction of the gaseous composition comprising 1-methyl-1-iso-propoxy-silacyclopentane or 1-methyl-1-iso-propoxy-silacyclobutane to deposit an organosilicon film on the substrate, wherein the organosilicon film has a dielectric constant of from 2.70 to 3.20, an elastic modulus of from 11 to 25 GPa, and an at. % carbon of from 12 to 31 as measured by XPS.

[Continued on next page]

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