

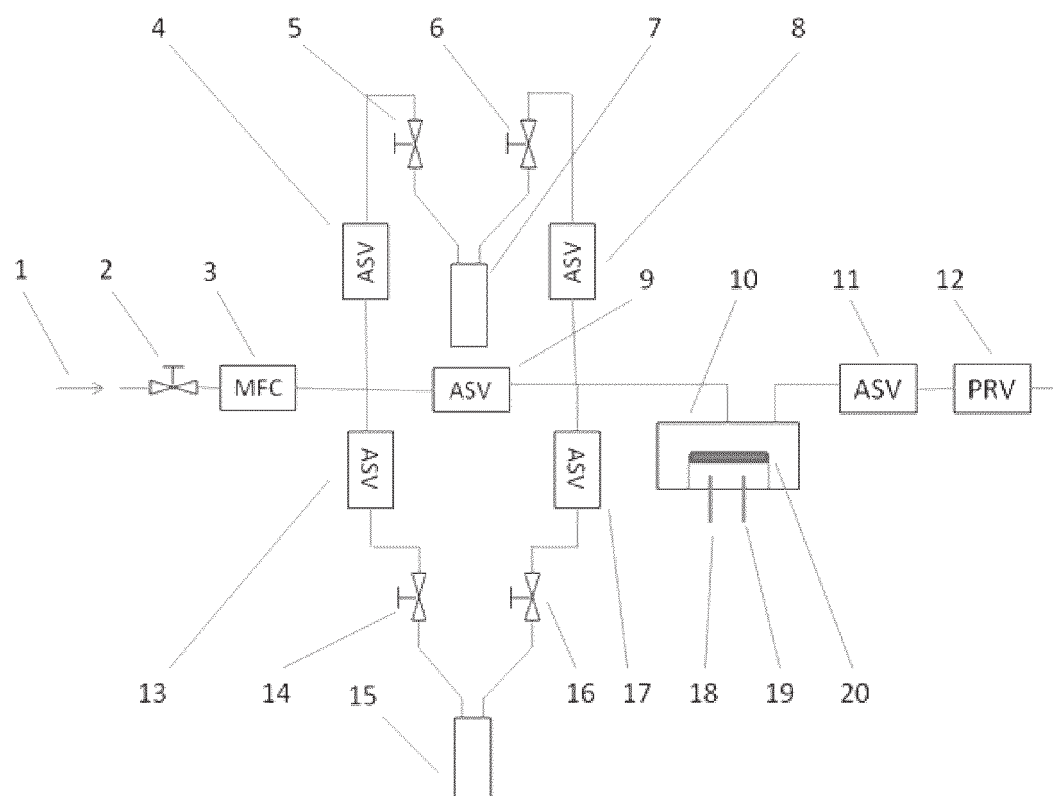


Figure 1 . Sketch of ALD system for thin film deposition.

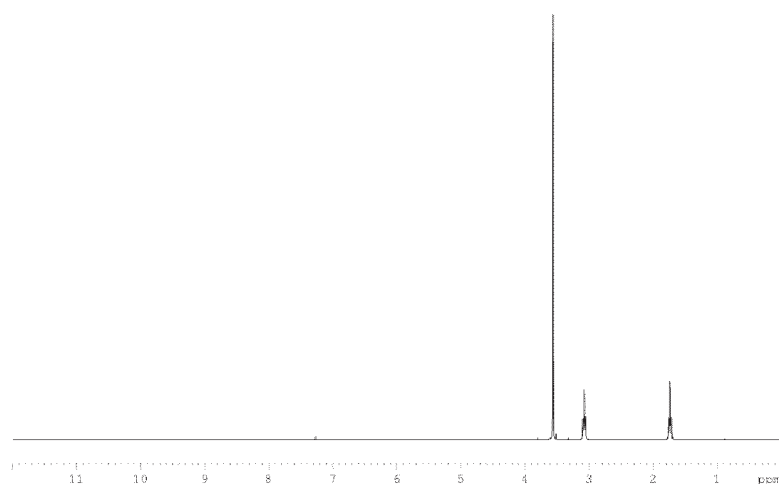


Figure 2 . NMR spectrum of (pyrro)Si(OMe)<sub>3</sub>

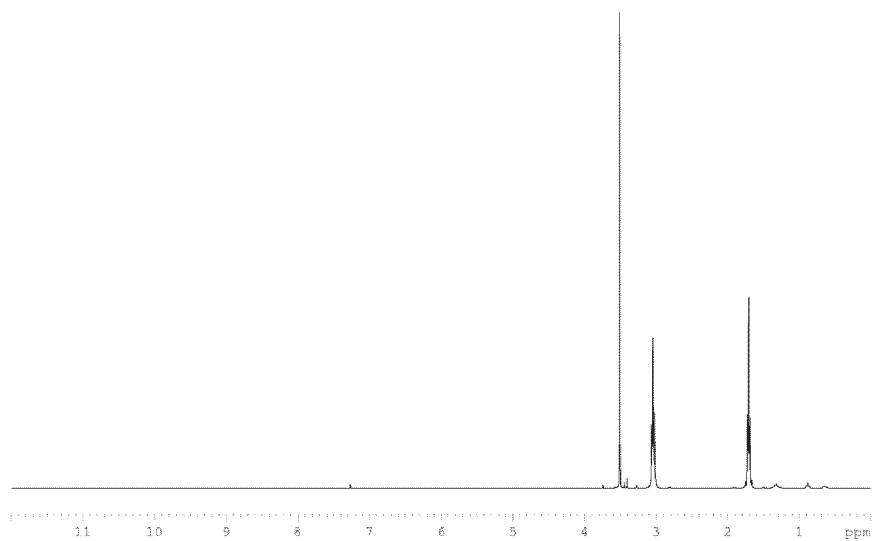


Figure 3. NMR spectrum of  $(\text{pyrro})_2\text{Si}(\text{OMe})_2$

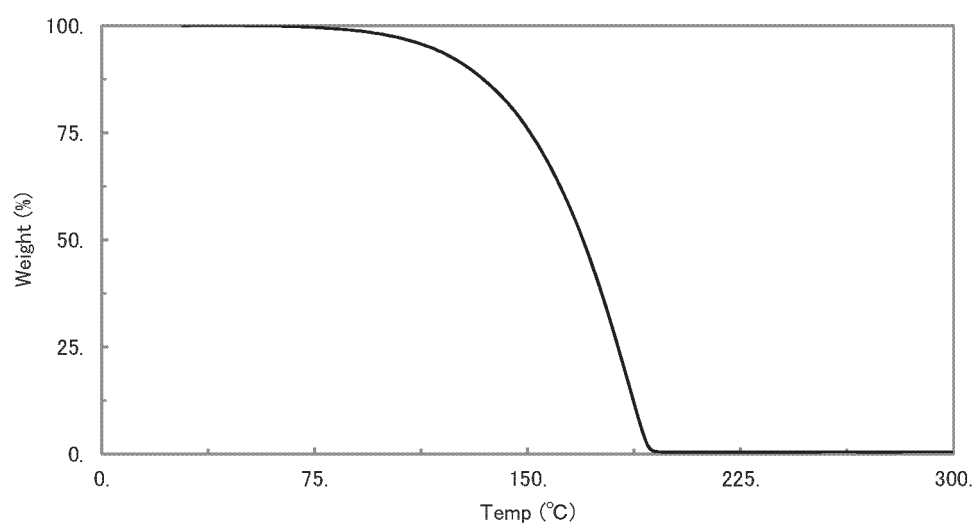


Figure 4. TGA of  $(\text{pyrro})_2\text{Si}(\text{OMe})_2$

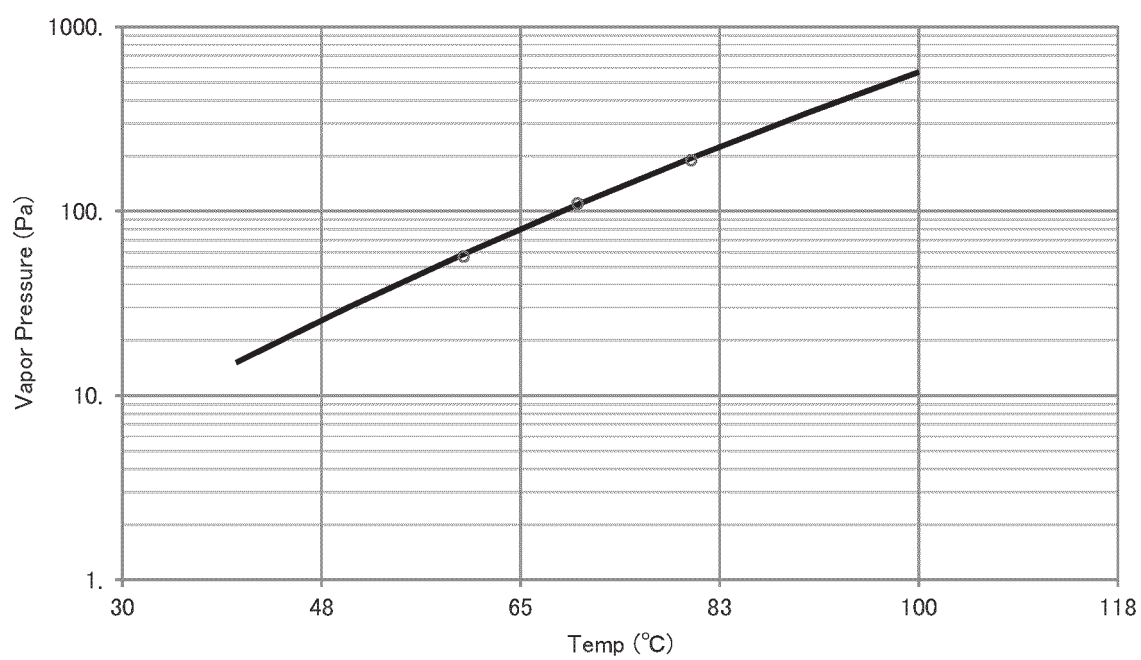


Figure 5. Vapour pressure of  $(\text{pyrro})_2\text{Si}(\text{OMe})_2$

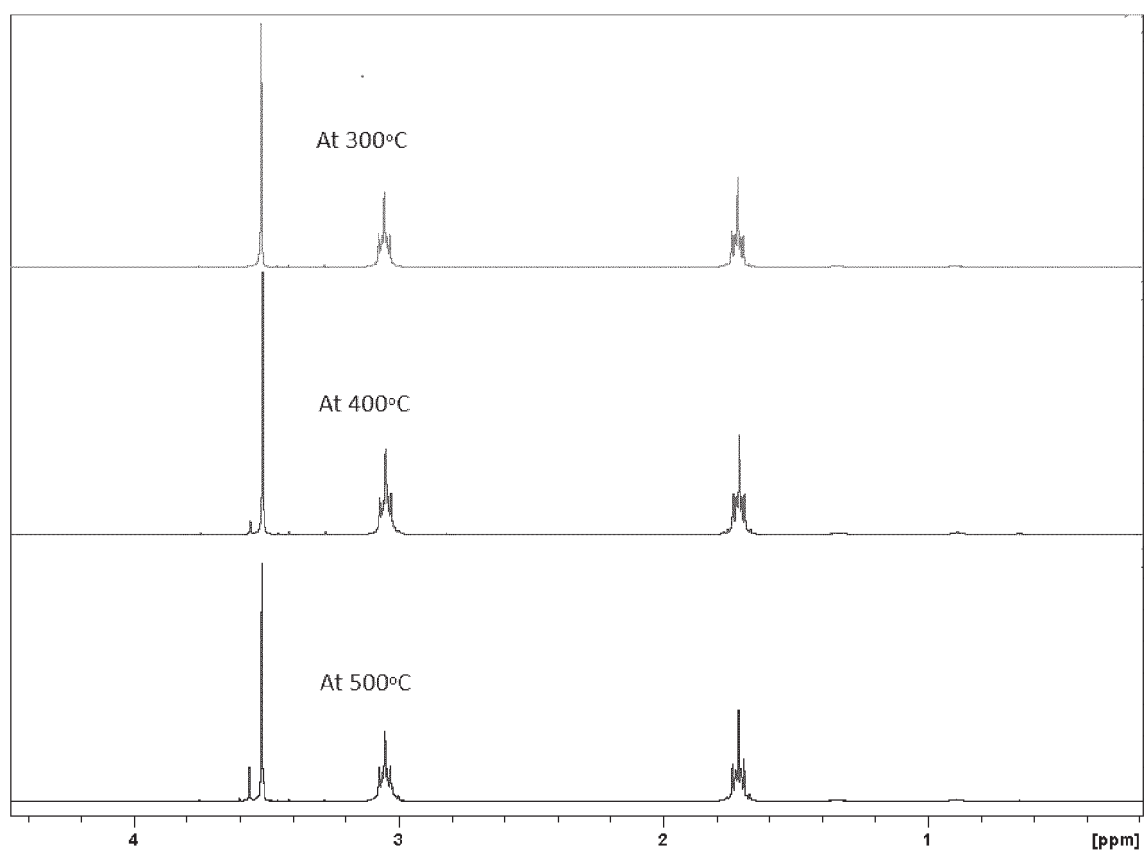


Figure 6. NMR spectra of thermally treated  $(\text{pyrro})_2\text{Si}(\text{OMe})_2$

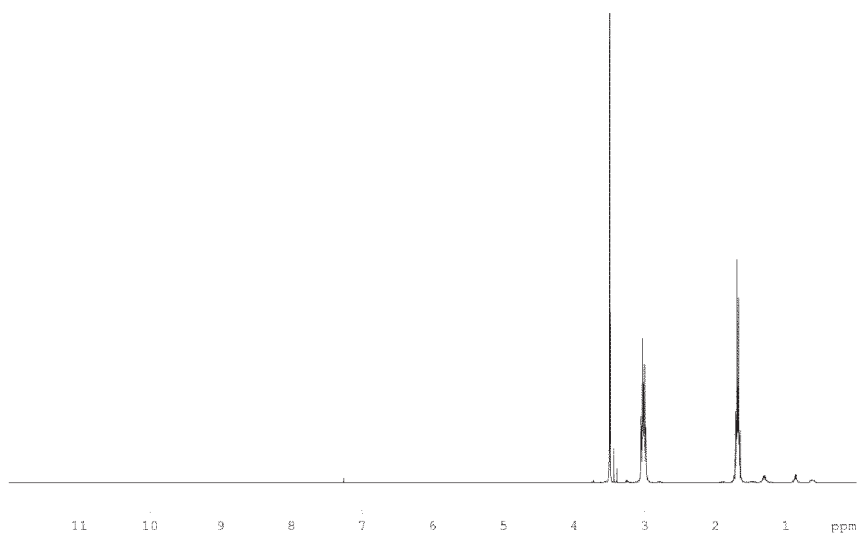


Figure 7. NMR spectrum of (pyrro)<sub>3</sub>Si(OMe)

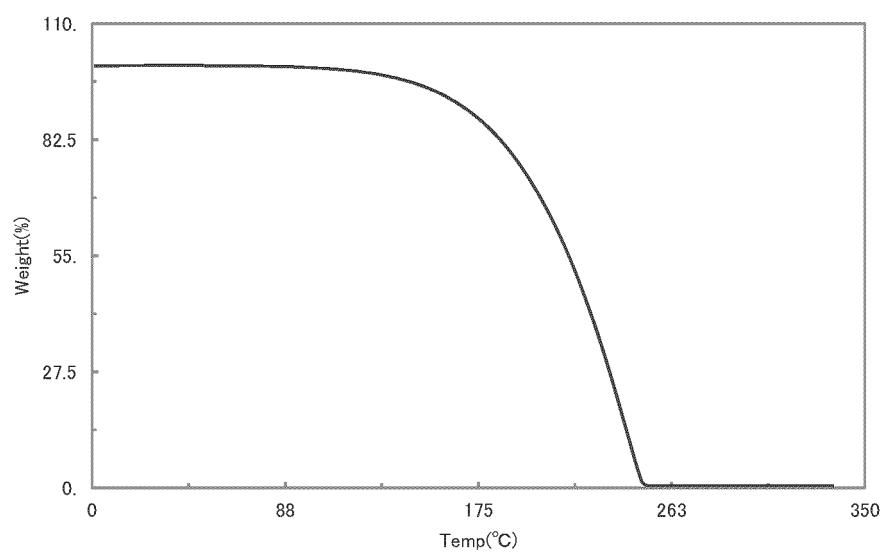


Figure 8. TGA of (pyrro)<sub>3</sub>Si(OMe)

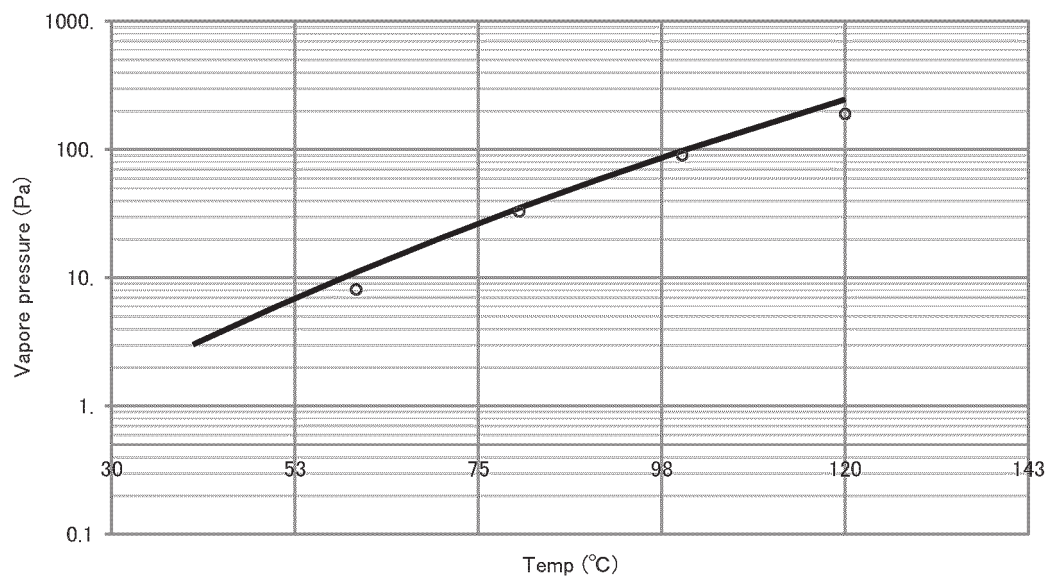


Figure 9. Vapour pressure of  $(\text{pyrro})_3\text{Si}(\text{OMe})$

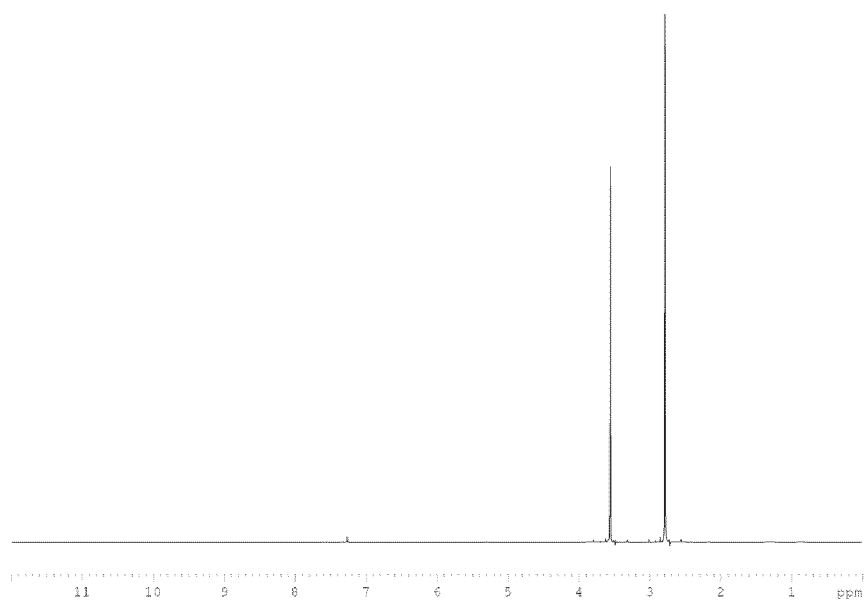


Figure 10. NMR spectrum of  $(\text{TetramethylguanidinyI})\text{Si}(\text{OMe})_3$

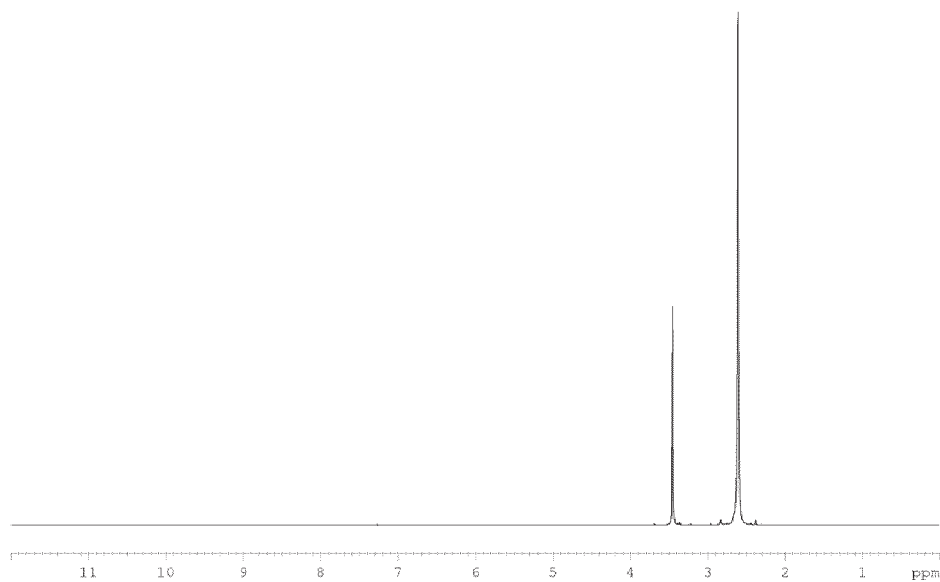


Figure 11. NMR spectrum of (Tetramethylguanidiny1)<sub>2</sub>Si(OMe)<sub>2</sub>

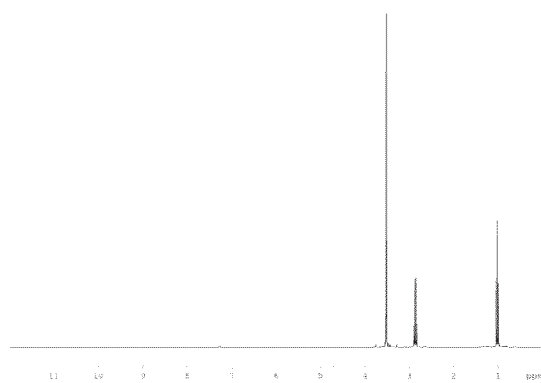


Figure 12. NMR spectrum of (Et<sub>2</sub>N)Si(OMe)<sub>3</sub>

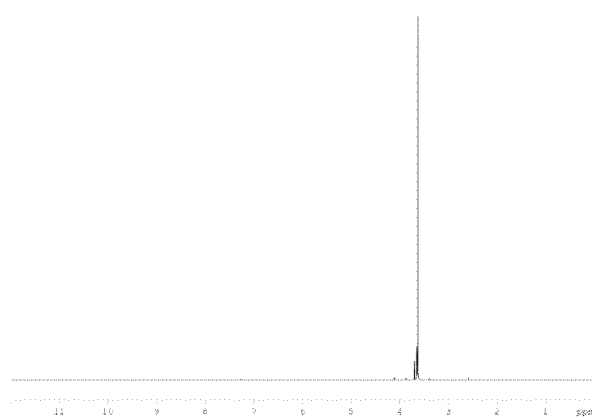


Figure 13. NMR spectrum of ClSi(OMe)<sub>3</sub>

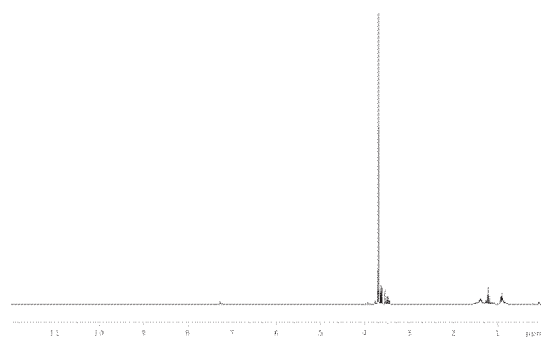


Figure 14. NMR spectrum of Cl<sub>2</sub>Si(OMe)<sub>2</sub>

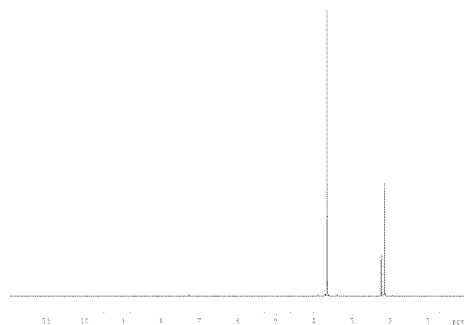


Figure 15. NMR spectrum of (AcO)Si(OMe)<sub>3</sub>

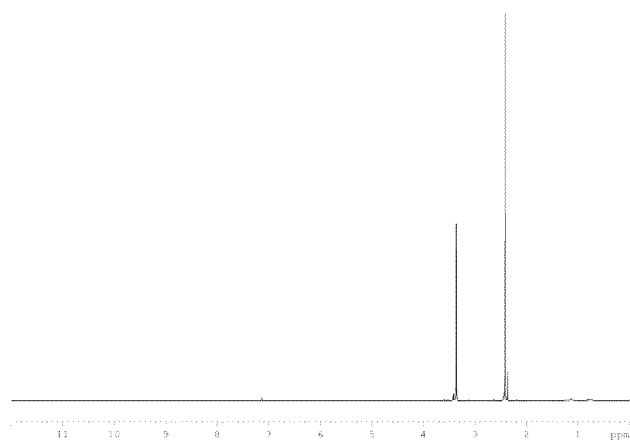


Figure 16. NMR spectrum of (Me<sub>2</sub>N)<sub>2</sub>Si(OMe)<sub>2</sub>

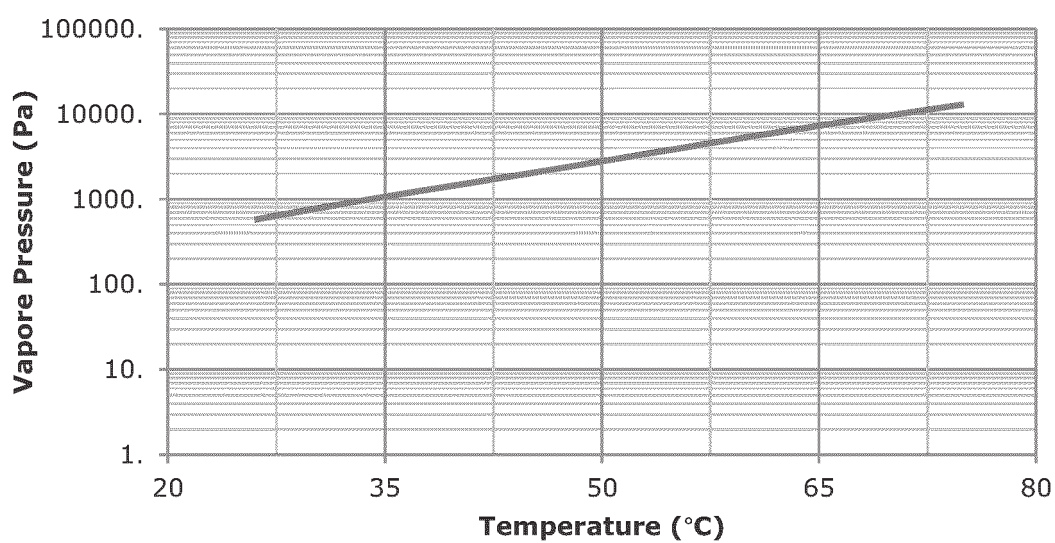


Figure 17. Vapour pressure of  $(\text{Me}_2\text{N})_2\text{Si}(\text{OMe})_2$

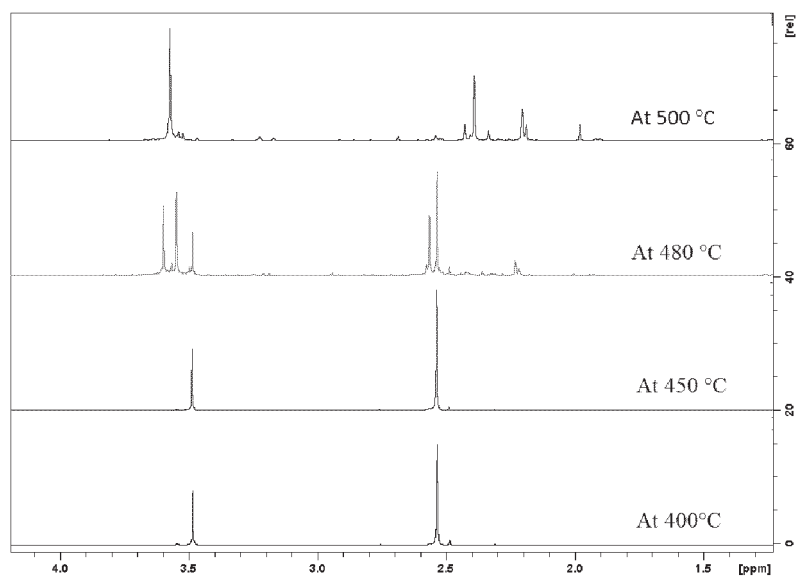


Figure 18. NMR spectra of thermally treated  $(\text{Me}_2\text{N})_2\text{Si}(\text{OMe})_2$

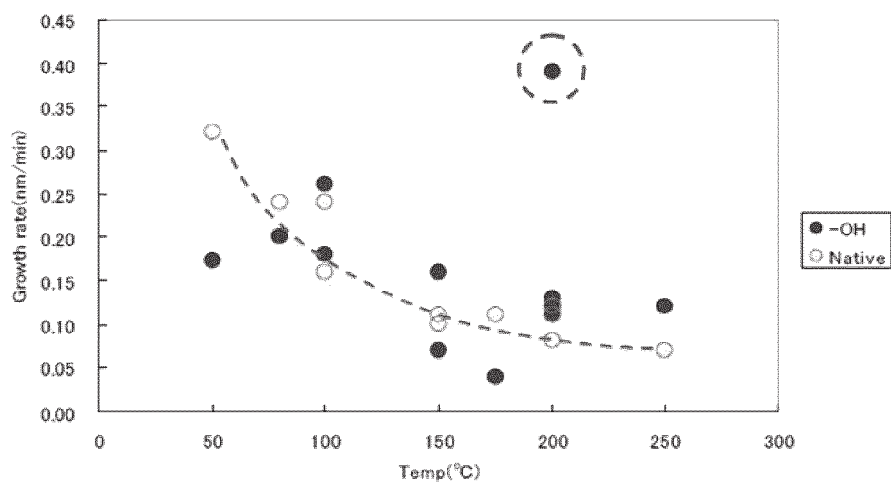


Figure 19. CVD growth rate vs. temperature of of SiO<sub>2</sub> using (pyrrolidine)<sub>2</sub>Si(OMe)<sub>2</sub> and H<sub>2</sub>O at 80 Torr.

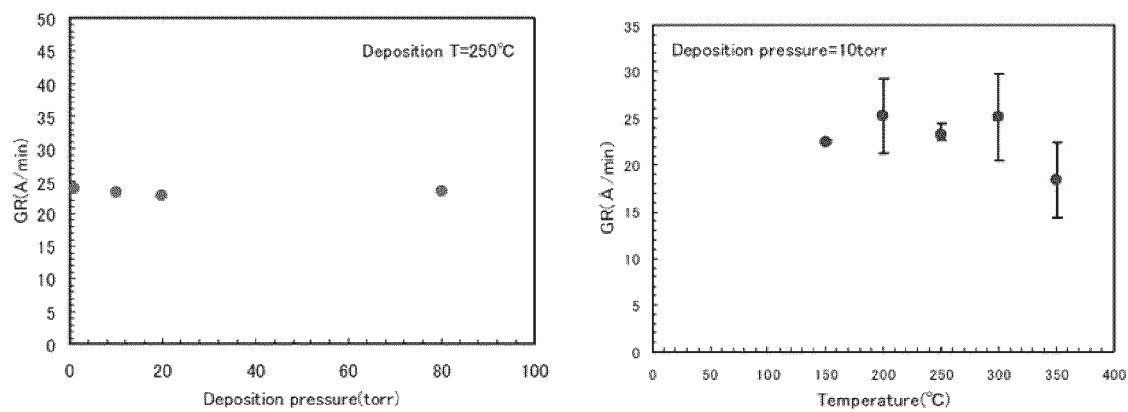


Figure 20. CVD growth rate vs. temperature and pressure of of SiO<sub>2</sub> using (pyrrolidine)<sub>2</sub>Si(OMe)<sub>2</sub> and O<sub>3</sub>

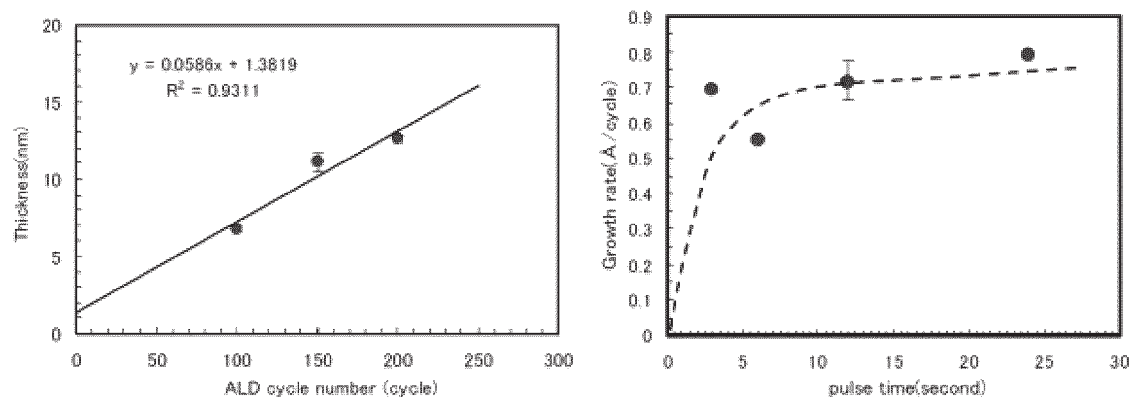


Figure 21. ALD of SiO<sub>2</sub> using (pyrrolidine)<sub>2</sub>Si(OMe)<sub>2</sub> and O<sub>3</sub> carried out showing linear film thickness with number of ALD cycles and flattening of the growth rate with (pyrrolidine)<sub>2</sub>Si(OMe)<sub>2</sub> pulse time

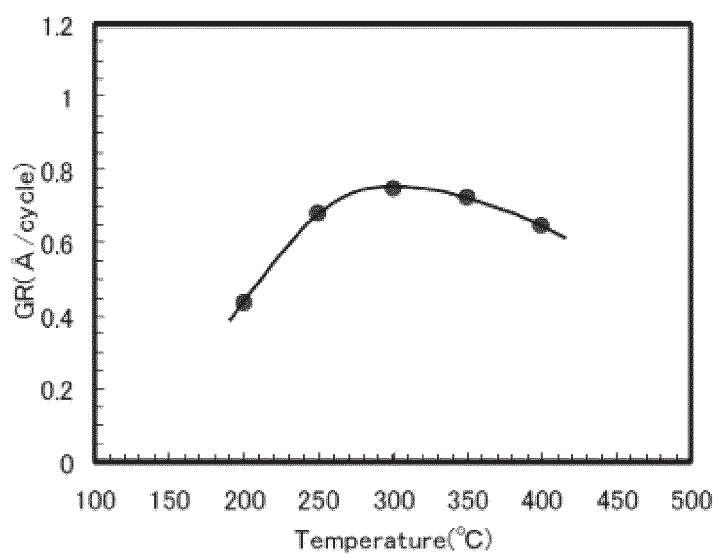


Figure 22. ALD of SiO<sub>2</sub> using (pyrrolidine)<sub>2</sub>Si(OMe)<sub>2</sub> and O<sub>3</sub> carried out, showing the temperature effect on the growth rate, suggesting best ALD window is 250-400°C

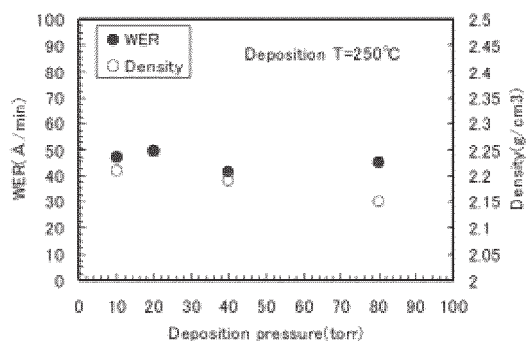


Figure 23. Wet etching rate of SiO<sub>2</sub> films in dilute HF acid (0.1%), films prepared by CVD at 250°C and various pressures using (pyrrolidine)<sub>2</sub>Si(OMe)<sub>2</sub> and O<sub>3</sub>

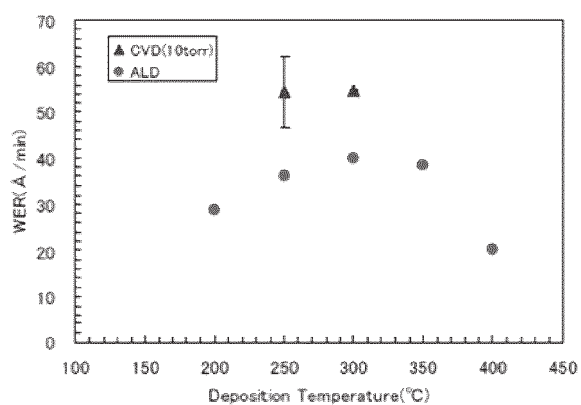


Figure 24. Wet etching rate of SiO<sub>2</sub> films in dilute HF acid (0.1%), films prepared by CVD and ALD at various temperatures using (pyrrolidine)<sub>2</sub>Si(OMe)<sub>2</sub> and O<sub>3</sub>

| Precursor                                                     | Oxidant                 | Deposition Temperature | Growth Rate (Å/cycle) | Wet Etch Rate (Å/minutes in 0.5% HF) |
|---------------------------------------------------------------|-------------------------|------------------------|-----------------------|--------------------------------------|
| Tris(dimethylamino) silane – 3DMAS                            | Ozone (O <sub>3</sub> ) | 350 °C                 | 0.9                   | 300                                  |
| Bis(diethylamino) silane – BDEAS                              | Ozone (O <sub>3</sub> ) | 350 °C                 | 1.2                   | 300                                  |
| Amino Silane A                                                | Ozone (O <sub>3</sub> ) | 350 °C                 | 1.8                   | 300                                  |
| (pyrrolodiny1) <sub>2</sub> Si(OMe) <sub>2</sub><br>Example 2 | Ozone (O <sub>3</sub> ) | 350 °C                 | 0.7                   | 200                                  |

Figure 25. Table showing the wet etching rate comparison of the new material with commercially available material used to carry out deposition of silicon oxide films using the same conditions