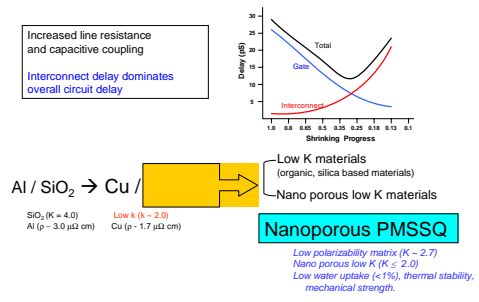


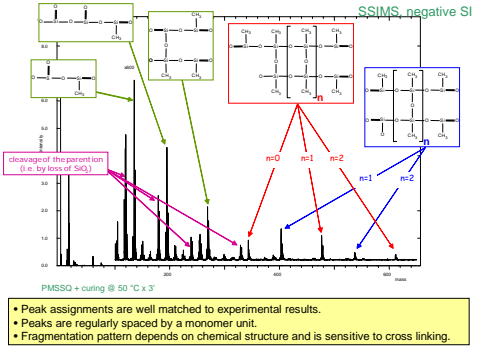
J.J. Park¹, Z. Lin¹, R.M. Briber¹, G.W. Rubloff¹, P. Lazzeri², L. Vanzetti², M. Bersani², M. Anderle², R.D. Miller³

¹ University of Maryland, 2145 A.V. Williams Building College Park, MD, ² ITC-irst, v. Sommarive 18, 38050 Povo, Trento, Italy, ³ IBM Almaden Research Center, San Jose, CA

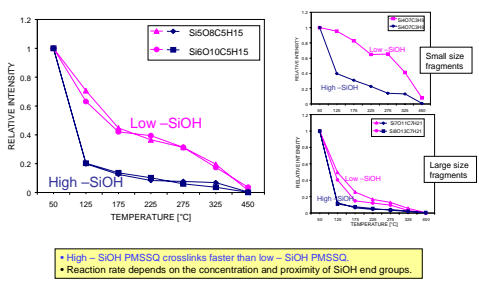
Device Shrinkage and Interconnect Delay



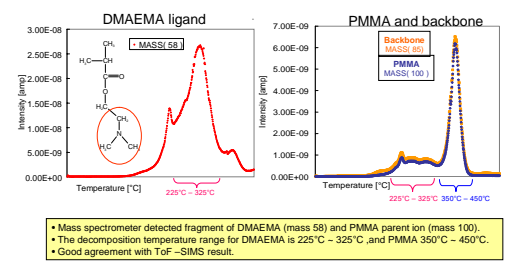
PMSSQ Finger Print Analysis



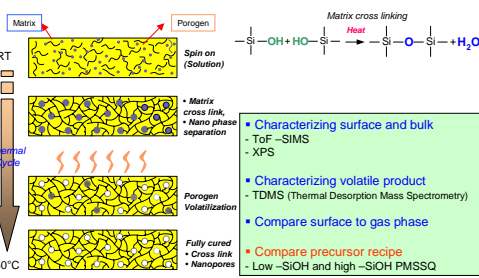
High -SiOH vs. Low -SiOH



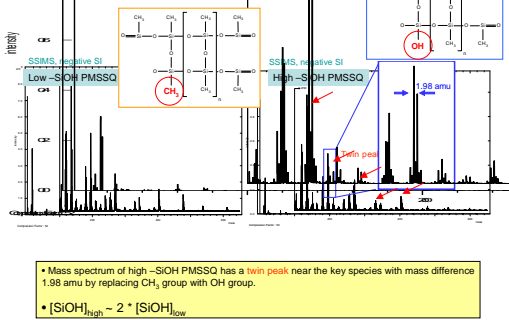
Porogen : Gas phase analysis



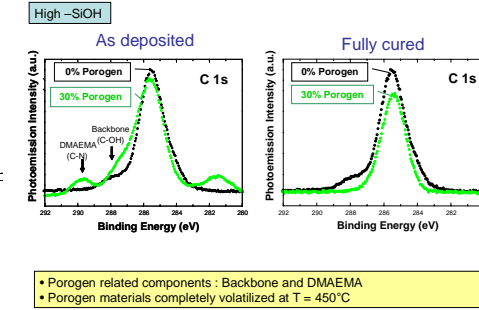
Strategy for Nanoporous Low - K



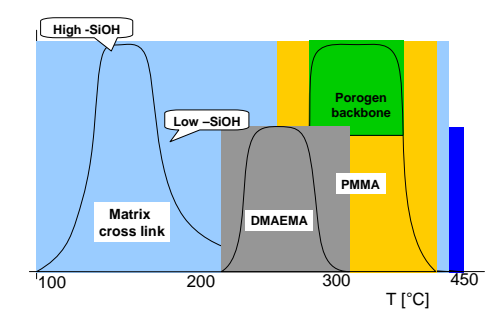
Precursor Chemistry



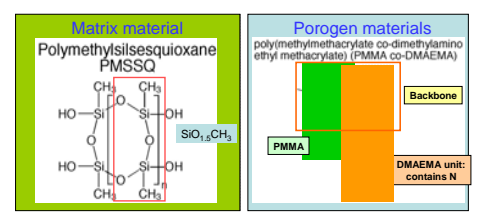
Porogen : Surface Analysis (XPS)



Thermal Behavior of Nanoporous PMSSQ

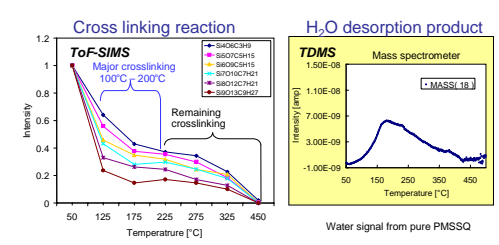


Nanoporous PMSSQ Materials

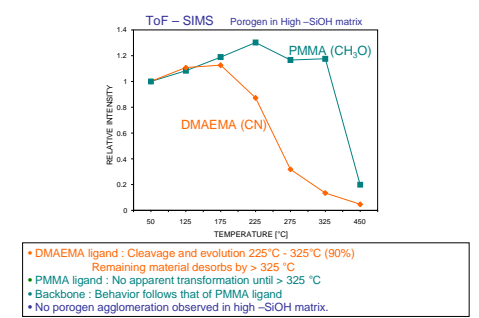


PMSSQ	Methyl group → Non-polar, hydrophobic and space-occupying Hydroxyl group → Cross linking of matrix
PMMA-co-DMAEMA	Tertiary amino group → Hydrogen bonding with OH in Matrix Miscibility between matrix and porogen

Polymerization of High -SiOH PMSSQ



Porogen : Surface Analysis



Conclusion

- ToF-SIMS, XPS, and TDMS were used to analyze the thermal behavior of porogen-containing PMSSQ
- Polymerization kinetics of PMSSQ Matrix
Polymerization of PMSSQ was observed mainly at 100°C - 200°C, and water was detected as a byproduct by mass spectrometry
Rate of polymerization depends on the concentration of OH functional groups: high -SiOH PMSSQ shows faster polymerization
- Porogen behavior upon thermal processing
Porogen materials decompose at higher temperatures than PMSSQ polymerization temperatures (> 225 °C)
DMAEMA and PMMA thermally decompose at different temperatures (225 °C - 300 °C, PMMA and backbone > 325 °C)