

CHAPTER V

CONCLUSIONS

The optimal mole ratio of reactants employed for silatrane synthesis is 1:1, TIS:SiO₂. The products give high % ceramic yield which is required in ceramic precursor processing. The other factors that affect the structure of silatrane products are vacuum distillation time and temperature. The optimum temperature is about 180°C at 1mmHg where high molecular weight species are obtained, and reversible reaction does not occur. After 12 hr under these conditions, most of the solvent, EG, is removed, and the monomer is totally converted to the larger molecule.

The transformations of silatrane complexes to polysilatrane gel was carried out using a cone and plate rheometer to observe and determine the gelling rate and investigate its relationship to the hydrolysis conditions. However, the exponent n value obtained was nearly constant ($=0.64\pm 0.04$), independent of hydrolysis rate and temperature (40-60°C). A homogeneous microporous glass is obtained by pyrolyzing the gel at 800°C. The surface area of the pyrolysed glass is also affected by hydrolysis and pyrolysis conditions. Glass formed under basic conditions (MgO/H₂O) has the smallest pores and largest surface area, but suffers from contamination by MgO.