

## CHAPTER IV

### CONCLUSIONS

The molecular weight evolution of silane in the presence of sizing agent in solution is different from that of silane solution without sizing agent.

Each type of sizing agents can influence the silanol condensation of silane in solution by different mechanism depending on the interactions between each type of sizing agent and the silane coupling agent.

Fourier transform infrared spectroscopy can be applied to study the condensation of  $\gamma$ -MPS in the presence of PVAc film forming sizing agent and also used to study the miscibility of the mixture systems.

The morphology of the system containing PVAc is postulated to be micelle-like structure since PVAc can be miscible with the methacryl-functional groups of  $\gamma$ -MPS. The presence of PVAc in the system causes acceleration in silanol condensation.

The effect of lubricating sizing agent on the silanol condensation of  $\gamma$ -methacryloxypropyltrimethoxysilane ( $\gamma$ -MPS) hydrolyzates has been studied by GPC and FTIR techniques. The decrease of hydrogen bonded carbonyl groups in the model sizing system indicates that the silanol groups can form

hydrogen bond not only with C=O of  $\gamma$ -MPS but also C-O-C in PEG chain. It was found that PEG sizing agent influences the silanol condensation of  $\gamma$ -MPS by two effects. One is the hindrance effect which comes from the restriction of silanol groups mobility by PEG chain. This effect inhibits the condensation. The other is the neighboring effect which enhances the silanol condensation. This effect occurs from the condensation between neighboring silane molecules which form hydrogen bond with the two adjacent oxygen atoms in PEG chain.