CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The present study showed that the fabrication of formed polystyrene/silica composite film on mica was accomplished using *in situ* admicellar polymerization within adsorbed surfactant aggregates. The surface morphology of the formed composite films on freshly cleaved mica was characterized by AFM.

The composite films formed in the absence of surfactant showed that the surface morphology of the film on mica was independent of the styrene and TEOS feed concentrations. That is, the surface characteristics of the four samples did not differ from each other. The surface morphology illustrated multigranular features scattered across the sample surface which appeared to be governed by the presence of TEOS but not by the presence of styrene.

For the films systems in the presence of surfactant the surface morphology was dramatically altered. From the synthesis conditions studied, it was found that the surface morphology of the formed composite film on mica was strongly affected by the styrene and TEOS feed concentrations. The packing of domains and aggregates of the resulting samples become more densely packed as the styrene feed concentration increased from 0.3 μM to 3 μM at a constant TEOS feed concentration. Well-defined spherical particles were observed at low TEOS concentrations incorporated into the styrene matrix polymer. The surface morphology was denser and more compact at the high TEOS feed concentration.

It was found that styrene at the concentration of 3 μM and TEOS at the concentration of 3 μM synergistically produced a polystyrene/silica composite film that was dense, highly compact with well-connected with periodic structure. Moreover, vacant or empty space and loose aggregate were not present.

It has been shown that the admicellar polymerization of two very different monomers can be accomplished to produce a composite polymer/silica ultrathin film on a mica surface. The results of this research opened the opportunity to fabricate the organic/inorganic composite film on mica by surfactant template technique.

5.2 Recommendations

The formation of polystyrene/silica film on mica by surfactant template technique when comparing to conventional methods requires considerably less equipment and chemicals, low temperature processing temperature, and provides process flexibility and versatility. This approach provides an attractive alternative to the processing of films, especially in applications where substrates cannot be exposed to high temperatures. This research has examined the feasibility of the formed polystyrene/silica composite using the nonionic surfactant adsorbed on the mica surface. Further study is recommended to investigate the properties of this composite material in terms of the synthesis conditions such as styrene and TEOS concentrations and to optimize the synthesis conditions to achieve the best properties of composite material.