CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Surface modification of nonporous silica by admicellar polymerization produces a new class of materials shown useful in many applications. The surfactant concentration, nature of the monomer, and monomer loading are important variables that can be controlled in order to afford specifically modified silica. The distribution and characteristics of styrene-isoprene copolymer films formed by admicellar polymerization have been studied and do indicate areas where additional research is needed to achieve an in-depth understanding of the mechanisms involved. All conclusions described are listed below:

CTAB adsorption on Aerosil®OX50, a nonporous silica, is found to have a plateau value of approximately 130 μmol/g of silica or 1.45 molecules/nm^2. Though the CTAB adsorption is believed to exist in the form of fully formed admicellar aggregates, it is possible that there was electrostatic repulsion between adjacent CTAB head groups causing the CTAB molecules to be unable to completely cover the silica surface, resulting in a lower CTAB adsorption.

The adsolubilization of styrene and isoprene into the adsorbed CTAB bilayers at both concentrations (20 and 100 μmol/g) increased with increasing comonomer concentration in the aqueous phase.

Styrene-isoprene copolymer thin films were deposited onto nonporous silica by admicellar polymerization, as confirmed by FTIR, TGA, and AFM. The investigated process variables (CTAB loading and comonomer loading) significantly affect the amount and characteristics of the copolymer formed. The results showed that the extent of copolymer coverage increased with increased CTAB adsorption and adsolubilized comonomer. The molecular weight of the copolymer formed increased when the amount of comonomer increased at both CTAB concentrations. The thickness of the deposited copolymer films was approximately 2-6 nm, as shown by the AFM cross-section analysis.

The application of modified silica can be used as reinforcing filler in the rubber compound and study the rubber compound properties.