

## Progress Report for January, Stewart Lewis

1. I started the month off with two polymerizations. The initial yield of each polymerization was close to 97%. Additionally, both polymerizations afforded polymer with values of  $M_w/M_n = 1.06$ . Recently I have invested a large amount of time in the purification of these polymers (in the removal of unreacted ATMS). Still, after several (2-3) purification steps on each fraction, ATMS impurity is present. However, I believe that with the use of acidified water, this residual impurity can be completely and effectively removed. Functionality of these materials seems very close to 100%.
2. I was able to synthesize diphenylchlorosilyl-ended PIB with little problem. I then converted the chlorine group to a hydroxyl group through the use of water or acidified water. IR confirmed that such a change had occurred, as did NMR. I first reacted this material with a very dilute solution of  $\text{SiCl}_4$  (0.5 ml in 125 ml hexane). At such a low level of  $\text{SiCl}_4$ , most of the material reacted with impurities before ever meeting up with the polymer. I repeated a similar reaction using higher  $\text{SiCl}_4$  concentration but haven't been able to check the results with GPC (something with the calibration isn't right).
3. I ran a hydrolysis/condensation reaction with triethoxysilyl-ended PIB that I had synthesized a long time ago. I will then use the resultant star + arm mixture in a preliminary study of Omura's selective precipitation scheme.

### Future work

1. After I have completely pure allyl-ended PIB, I will run a series of hydrosilylation reactions to generate the trichloro and trimethoxy materials. I will hydrolyze and condense these materials and try Omura's techniques in order to isolate certain fractions of the reaction mixture.
2. I will continue studying the diphenylhydroxyl/ $\text{SiCl}_4$  system and will also try the related  $\text{Na}_4\text{SiO}_4$  system in an attempt to generate 100% four armed star.
3. I am going to use any additional free lab time to study the synthesis of trifunctional initiator.

### Formal Talk

1. I have the following: a large review dealing with reactions of halides and esters of Si, a book on the sol-gel process, papers on ceramer type materials (i.e. Mark), a preprint on the kinetics of R-Si(OR') condensations, and one paper dealing with PS stars and networks using similar chemistry (anionic chain end capped with a phenyl ring bearing trimethoxysilyl groups). I am in the process of summarizing these works into helpful notes.