Chapter V

Conclusion

The new photoresist poly(*p*-epoxystyrene-co-styrene-co-N-phenylmaleimide) could be achieved by new synthetic route.

The synthesis was started with preparation of the monomers, N-phenylmaleimide and *p*-chloromethylstyrene. The former was prepared from the reaction of aniline, maleic anhydride and acetic anhydride with 74.86 % yield. The latter was synthesized by using the method of Kondo et al which consisted of two steps. The fisrt step was chloromethylation of 2-phenylethyl bromide and, then, the second one was dehydrobromination of *p*-(2-bromoethyl)benzyl chloride to give *p*-chloromethylstyrene with overall yield of 37.05 %. Poly(*p*-chloromethylstyrene-co-styrene) and poly(*p*-chloromethylstyrene-co-styrene-co-N-phenylmaleimide) were synthesized by using solution polymerization with AIBN as initiator. The amount of N-phenylmaleimide was varied as 5, 10, 25 and 50 % by mole. For poly(*p*-chloromethylstyrene-co-styrene), it had weight average molecular weight (Mw) of 32,995, and the glass transition temperature (T_g) of 94.75 °C. The poly(*p*-chloromethylstyrene-co-styrene-co-N-phenylmaleimide) had weight average molecular weight (Mw) of 49326, 87324,143302 and 148590, and the glass transition temperature (T_g) of 101.49, 102.51, 135.69 and 181.40 °C

The chloromethyl groups in the polymers were oxidized to carboxaldehyde groups with DMSO and sodium bicarbonate. Then the epoxidation was performed to convert the carboxaldehyde groups to the epoxide groups using a trimethylsulfonium chloride and a phase transfer catalyst. This method afforded the better yield on the epoxidation than the other ones because of the less ring opening during the reaction. The glass transition temperature of poly(p-epoxystyrene-co-styrene) was 102.7°C, while those of poly(*p*-epoxystyrene-co-styrene-co-N-phenylmaleimide) were 111.8, 127.3, 148.5 and 195.7 °C for 5, 10, 25 and 50% mole of N-phenylmaleimide, respectively. It was shown that the N-phenylmaleimide can promote the glass transition temperature of polymers.