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Synthesis of New Side Chain Liquid Crystalline Azo-Polymers with Chirality and Their Applications to Optical Memory Devices

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Due to their useful applications such as electronics and photonics, organic nonlinear optical materials have received intensive interest. Among them, azo polymers have been known to show the highest photoresponsibility[1]. In this research, new optical active monomer CEMA (Figure 1) was synthesized by the reaction of 2-acryloylaminopropionic acid and azobenzonitrile derivative. The monomer was homo- and co-polymerized with methyl methacrylate in the presence of radical initiator to obtain corresponding polymers (Table 1). Their resulting thin films exhibited fundamental characteristics as reversible optical data storage media through a photoisomerization of azobenzene group in the side chain.[2] In particular, increasing temperature in the write-in process drastically increased the optical birefringence of the polymeric thin films. In addition, we found that the homo- and copolymers from CEMA showed a helix inversion, when the polarized UV light was irradiated onto their polymeric solutions in chloroform.

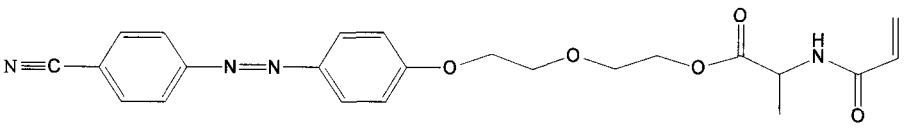

Figure 1. Structure of the CEMA monomer.

Table 1. Polymerization Results for Homo- and Copolymers and Their Optical activities

	Feed ratio (CEMA : MMA)	Copolymer composition	Conversion (%)	T_g (°C)	Mn	Mw	PDI	$[\alpha]_{534}$ (deg.)
Homopolymer	100 : 0	100 : 0	55	55	6000	6700	1.12	-40
P(CEMA-*co*-MMA)-1	70 : 30	72 : 28	58	59	12400	22200	1.79	+19
P(CEMA-*co*-MMA)-2	50 : 50	45 : 55	49	65	10300	12900	1.25	+20
P(CEMA-*co*-MMA)-3	30 : 70	23 : 77	57	78	10300	19400	1.88	+25
P(CEMA-*co*-MMA)-4	10 : 90	18 : 81	83	88	26300	51200	1.95	+42

< $[\alpha]_{534}$ of CEMA: +30 (deg.) >

References

1. Murano, M.; Li, Y., Kawakami, Y., *Macromolecules* **33**, 3940-3943 (2000).

2. W.J. Joo, C. H. Oh, and Y. K. Han, *Phys. chem.* B, **106 (21)**, 5378-5381 (2002).