Control of Decoloration Rate of Photochromic Spiroxazine

Chi-Hee Ahn, Sung-Hoon Kim

Department of Dyeing and Finishing, Kyungpook National University, Daegu 702-701 Korea

The design and synthesis of functional molecules with molecular switching characteristics is currently an area of intense activity and tremendous potential significance to the fields of molecular electronics and sensor device fabrication. Spiroxazines are photochromic compounds analogous to spiropyrans. On UV irradiation, the C-O bond of the colorless spiroxazine (SP) is cleaved and the colored merocyanine (MC) form is obtained. Because of their high fatigue resistance, considerable attention has been paid to the synthesis and photochromic properties of spiroxazine. Photochromic spiroxazines are recently given considerable attention as functional dyes for reversible image recording medium on account of their high fatigue resistance in the reversible reaction of coloring and decoloring. In such case, it is important to control the stability of its photocolored state.

We synthesized two copolymers bearing spiroxazine in the side chain for studying their decoloration rate. One of the copolymers contains methylmethacrylate (MMA) and methacrylate-spiroxazine (MA-SP), copolymer1. The other one, copolymer 2, contains methacrylate-spiroxazine (MA-SP) and Methacrylate chalcone (MA-CH) as a comomomer. Since the colored MC form of spiorxazine is much different from the SP in their polarity and chemical structure, the coloration and decoloration process would be affected with micro-environmental condition. In this report, we suggested that the photochromic property of spiroxazine could be affected by the control of the free volume around spiroxazine unit. From the evaluation of decoloration process, the decoloration process in copolymer 2 after UV irradiation is much retarded by increasing steric hindrance resulted from intermolecular phocycloaddition of chalcone unit.