

가교 고분자 계에서 광이성질화의
억제효과와 두 시간상수의 동적 특성 연구

Suppression Effect and Coupled Two-Time Motion of the
Photoisomerization in the Crosslinking Polymer System

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The photoisomerization of the crosslinked and uncrosslinked polymer-pair with azo linkages was studied by the photoinduced birefringence. The amount of photoinduced birefringence of crosslinked polymer system was much smaller than that of uncrosslinked polymer system, even when varying pumping laser power, so the photoisomerization of an azo chromophores could be controlled by crosslinking process.

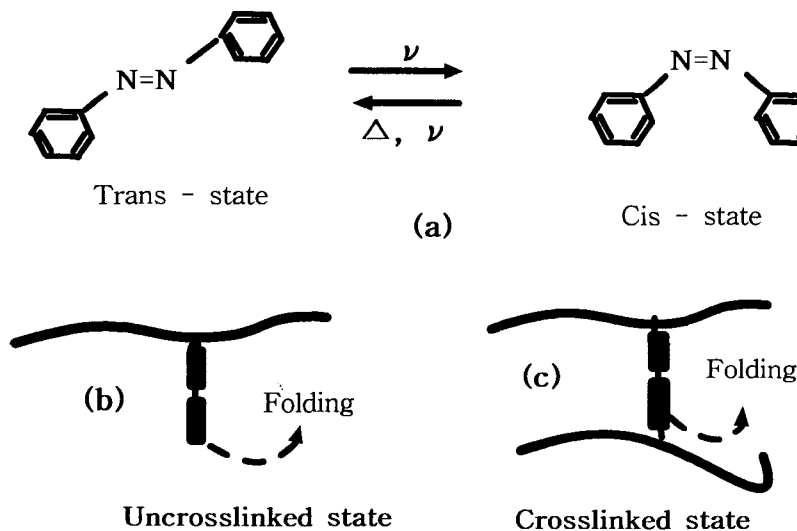


Fig. 1 The photoisomerization of an azo linkage(a); the folding of the uncrosslinked chromophore(b) is easier than that of the crosslinked one(c) by optical pumping.

This suppression effect of photoisomerization in the crosslinked system which is more bulkier than the uncrosslinked system could be understood on the one hand as an increased moment of

inertia and on the other hand as a decreased quantum yield of the molecular dipoles attached to the crosslinked polymer system. The inducement of birefringence in crosslinked system means that the photoisomerization of chromophore rearranges the orientation not only of the chromophore itself but also of polymer main chain. In the photoinduced process, all the data were fit well to the biexponential functions for the writing and the relaxation.

From the data analysis, we found there are two characteristic time scales in the photoisomerization process, a fast and a slow time mode, and in the relaxation processes, they exhibit a coupled relation in a complementary way.

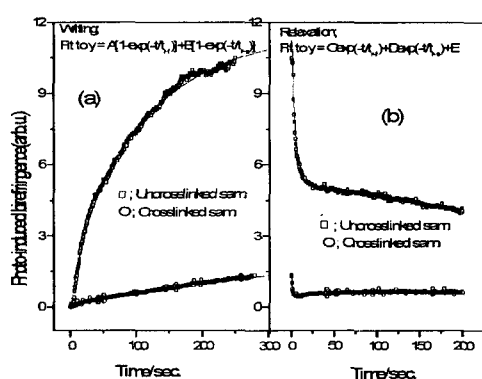


Fig. 2 The experimental results and fit curves of photoinduced birefringence and its relaxation at the pumping power of 0.89 W/cm^2 .

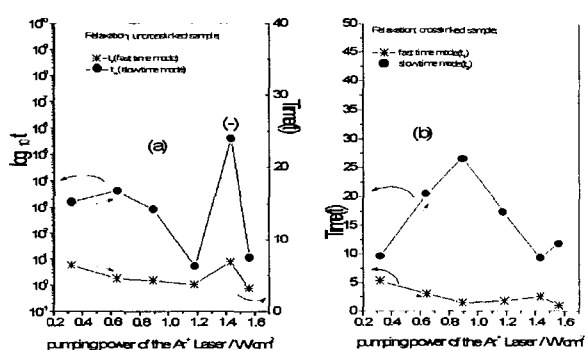


Fig. 3 At various pumping power, two time modes in the relaxation process, where * represents fast time mode t_{r-f} and ● represents slow time mode t_{r-s} in the fitting function of the uncrosslinked sample(a) and the crosslinked sample(b), respectively.

REFERENCE

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