

Synthesis and Characterization of Novel Polyester-amine for Nonlinear Optics

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1. Introduction

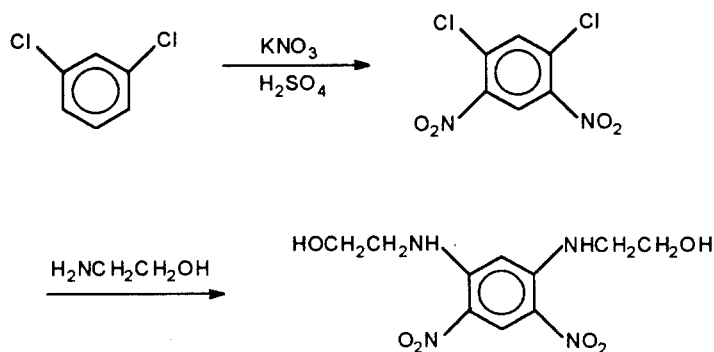
A novel compound, 1,5-bis(2-hydroxyethylamino)-2,4-dinitrobenzene (BHDB), was synthesized for incorporation of nonlinear optical units to the polymer main chain. Polyester-amine was obtained by solution polycondensation reaction of BHDB with isophthaloyl chloride.

The optical nonlinearity of the polymer was investigated by measuring second harmonic generation.

2. Experimental

Synthesis of 1,5-bis(2-hydroxyethylamino)-2,4-dinitrobenzene (BHDB)

BHDB was synthesized according to the following reaction scheme.



Polymerization

The polycondensation of BHDB with isophthaloyl chloride was carried out in dimethylacetamide/pyridine/LiCl solvent.

Characterization

The polymer was characterized by viscosity measurement, thermal analysis, infrared, and ultraviolet spectroscopies.

The polymer film was prepared by spin-coating on a soda lime glass from phenol/p-chlorophenol/tetrachloroethane solution. The film was corona-poled by applying electric field at about 10°C below T_g for 60 min. The measurement of second harmonic generation was performed by illuminating a Nd-Yag laser with a 1064 nm wavelength. The refractive indices were measured by m-line method at 532 nm and 1064 nm.

3. Results and Discussion

The polymer is amorphous one of which T_g is 125°C . Transparent polymer film could be obtained even though the inherent viscosity is low (0.12 dl/g). The refractive indices are 1.777 for TM and 1.738 for TE at 532 nm, and 1.691 for TM and 1.655 for TE at 1064 nm, respectively. The nonlinear optical coefficients determined by Maker fringe method will be discussed.