NONLINEAR OPTICAL PROPERTIES OF POLYMERS AND APPLICATION TO PHOTONICS

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The field of photonics has drawn much interest as a frontier science that has many applications to the future technology. Nonlinear optics (NLO) is a part of photonics whose technology includes acquisition, storage, process, and transmission of photons instead of electrons in signal processing.

Organic materials systems showed some promising motives to fabricate the optical device. Most promising study on the development of new materials for second-order nonlinear optical applications is accounted the poled polymers. Dipolar groups in the polymeric film can be aligned to the desired direction during poling process and a net dipolar alignment is then sustained in the microscopic structure. Particularly, sidechain poled polymers have drawn remarkable interest in recent years as promising candidates for application in electro-optic and photonic devices.

Currently, one important issue has been postulated for practical application. The macroscopic second-order nonlinearaty of organic materials has already overcome that of inorganic materials. One dismerit of organic polymeric materials is the instability of the NLO activity. Thermal stability of desired polymer structure is not so good as that of inorganic materials. This is closely related to the long term stability of the second-order NLO activity.

In this work, not only are the high temperature stable second-order NLO chromophores developed but the robust polymeric backbones also are being considered. We are also currently pursuing this endeavor in our group and making much effort to apply them to prototype device. It is seeing that the organic photonic devices will come true in near future by virtue of much interest from multidisciplinary fields.