

Interaction between Materials and Laser Light

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Keywords

(1) Ultrashort pulsed laser; (2) Organic materials; (3) Organic NLO materials (35030)



Research Topics

- Interaction of materials with ultrashort pulsed laser light
- Fabrication of organic nonlinear optical (NLO) crystals
- Development of a novel NLO polymer
- Fabrication of optical waveguides of organic materials

Research Seeds

Ultrashort pulsed laser light irradiation on materials engenders the occurrence of various nonlinear optical processes and simultaneous emission of X-rays from materials. Because characteristic X-rays contain information related to elements contained in the materials, simple elemental analysis is possible. Using this method, we expect to develop simple and inexpensive detection methods for elements of foods, leaves of trees, and various materials.

Fabrication of organic nonlinear optical (NLO) crystal

Organic nonlinear optical materials, which have attracted much attention because of their superior NLO properties and ultra-fast response, are promising materials for optical information processing. Actually, DAST crystal, the most popular organic nonlinear optical crystal, is often used for electro-optical switching and terahertz generation. These research themes are the design of novel DAST derivatives and development of a method of growing single crystals with few defects.

Developing a novel NLO polymer

Polymer materials are excellent for mass production of optical circuits because wet processing is useful for thin film fabrication. In NLO polymer materials, the NLO chromophores in the polymer are expected to have a non-centrosymmetric orientation. Therefore, the NLO chromophores that bond or disperse to the polymer are oriented by an electric field. To retain the non-centrosymmetric orientation, the polymer structure and the chromophore structure have been improved.

Fabrication of optical waveguide of organic materials

The optical waveguide of inorganic materials is produced using a multistep process incorporating photolithography and reactive ion etching. Fine structure fabrication technology has been developed according to the mold replication process, by which the features of solubility and plasticity of polymer were enhanced.

Related Technology

- Ultrashort pulsed laser beam irradiation
- Crystal growth technique for organic materials
- Synthesis of organic NLO polymers