



Spatial Light Modulator and its Application to Optical Information Processing

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Various kinds of spatial light modulators (SLMs) have been developed for optical information processing. We started our research on an SLM at the beginning of the 1980's and have thus contributed to the progress of optical information processing.

Recently, two-dimensional phase-only light modulation has aroused a great deal of interest in many areas, such as optical correlation, optical interconnection, optical manipulation, laser processing, adaptive optics and holographic measurement. As a result, there is a strong call for a spatial phase-only light modulator for these applications.

In order to provide a practical device, we developed a non-pixelized, optically-addressed, parallel-aligned nematic-liquid-crystal spatial light modulator (PAL-SLM). We obtained a large depth of phase-only modulation based on the electro-optical characteristics of a parallel-aligned nematic-liquid-crystal layer.

Moreover, the phase-only modulator must be controlled with a computer if it is to produce real-time displays of computer-created patterns. We therefore developed a non-pixelized electrically-addressable spatial light phase-only modulator (PPM). The device consists of a PAL-SLM, coupling optics, a liquid crystal display (LCD), a laser diode (LD) and collimating optics.

These characteristics of spatial light modulators are useful for many practical applications. We present the latest advance in applications' research using spatial light modulators.

Keywords : Spatial light modulator, Optical information processing, Liquid crystal, Optical phase control

Development of Electronic Paper for Electronic Book Terminal

Takanori MORIKAWA

Electronic paper is just as legible as paper, has a low consumption of power, and is expected to be used as an effective display medium. It is equipped with the capability which neither STN nor a TFT display has. We believe it has a potential in the market place. The digital book business is expected to become a big market. Various companies, Universities, and research institutions are doing research and development into electronic paper worldwide.

In this paper, we discuss the function, specification and manufacturing of electronic paper.

Keywords : Electronic paper, Electronic book

Recent Advances in the Understanding of Thermotropic Cubic Mesophase

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A review of the recent advances in the understanding of the thermotropic cubic (Cub) mesophase is presented, giving special attention to two homologues, 4'-*n*-alkoxy-3'-nitrophenyl-4-carboxylic acid (ANBC) and 1,2-bis-(4'-*n*-alkoxy-benzoyl)hydrazine (BABH). The phase diagram as a function of temperature and alkoxy chain length, the molecular packing models of both Ia3d-type and Im3m-type Cub phases, as well as the roles of the aliphatic tail and the central core, which exhibits hydrogen-bonding allowing the formation of the Cub phase, are discussed.

Temperature-induced packing frustration within SmC layers due to the unsymmetrical shape between the aliphatic tail versus the aromatic core, just like polar versus apolar competition in lyotropic systems, is significant for the Cub phase formation, and therefore the quasi-binary picture is an effective way to understand the behavior of the molecules. In thermotropic

systems, however, the presence of other contributions of intermolecular interactions such as hydrogen-bonding, dipole-dipole interactions etc. is also important and modifies the phase formation.

Keywords : Thermotropic cubic phase, Lyotropic system, Structure, Ia3d-type cubic phase, Im3m-type cubic phase, ANBC, BABH

Stimuli-Responsive Nematic Gels

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Liquid crystalline gels have attracted much interest as a hybrid material possessing both characters of liquid crystals and polymer networks. The hybrid character yields interesting phenomena and functions which are specific to liquid crystalline gels. We review our studies on the volume phase transition induced by the nematic-isotropic phase transition and the electro-optical effects with anisotropic deformation in nematic gels.

Keywords : Liquid crystalline gel, Volume phase transition, Electrical deformation, Electro-optical effect, Soft actuator