1. Main Research Results

1) Banana-shaped Liquid Crystals 7, 12, 14, 21

The number of citation of the first banana LC paper (J. Mater. Chem. 1996) reported together with Prof. J. Watanabe's group became 618 (Feb. 16, 2009, ISI), and that of the review paper (Jpn. J. Appl. Phys., 2006) became 106 (Feb. 16, 2009, ISI). We continued to investigate this liquid crystal system.

Under collaboration with Prof. J. Watanabe, banana-shaped liquid crystals with asymmetric cores were synthesized and characterized, showing possible new structures [7]. Electroconvection effect so-far conducted in rod-like liquid crystal was measured in bent-core nematic liquid crystals and observed chiral structure formation [12]. Kerr effect measurement was conducted in banana mesogens for the first time, although the Kerr constant was small [14]. One of the most interesting topic in banana mesogens is the emergence of biaxial nematic phase. So far many scientists have reported the discovery of biaxial nematic in many materials. We collaborate with Prof. A. Jakli in Kent state univ. to propose and demonstrate a new but simple optical method to examine the biaxiality. We proved that the molecule which was reported to show the uniaxial to biaxial nematic phase transition was actually the uniaxial nematic phase in entire temperature range [21].

2) Other Liquid Crystals 2, 16, 17

Besides banana-shaped liquid crystals, we studied some other liquid crystal systems such as new discotic liquid crystals (synthesis and characterization) [2], paramagnetic ferroelectric liquid crystal (magnetic-field-induced molecular alignment) [16], discotic liquid crystals with a collanure core which can be aligned by an electric field (synthesis and characterization) [17]. These are the consequence of collaboration works with Center for Liquid Crystal Research of India, Prof. R. Tamura of Kyoto Univ. and Prof. T. Aida of Tokyo Univ, respectively.

3) Photonic Devices 1, 4, 5, 6, 8, 9, 10, 11, 15, 18

Most actively studied area in 2008. We studied optical devices with periodic structures such as cholesteric liquid crystals. We successfully achieved good results in OLED, laser device and optical reflection film and so on. Contrary to common knowledge, i.e., cholesteric liquid crystal reflects light corresponding to the helical pitch, we succeeded in getting films, which reflect RGB light, using cholesteric liquid crystal film and isotropic polymer film [1]. Further by making a dye-doped film sandwich by these hybrid films, we succeeded in RGB simultaneous lasing [5]. As for OLED devices using photonic structures, we succeeded in increasing external efficiency using imprinted one- and two-dimensional photonic crystal [4,8]. Polarization tunable OLED devices using electric-field-tunable nematic liquid crystal film was also realized [10]. Same function was also applied to lasing devices, i.e., polarization-tunable surface-emitting lasers using in-plane periodic structures was made [11,15]. The decrease of threshold energy was achieved using two dyes between which a energy transfer was possible [6]. Stabilization by polymerization was achieved in cholesteric liquid crystal lasers with pitch gradient showing lasing over full visible
wavelength [9]. Omnidirectional lasing device was made under the collaboration with Korean group [18].

4) **Organic Transistors** 3, 13, 20
We collaborated with Prof. T. Mori in organic transistors to improve contact resistance [3], stability [13], and fabrication process [20].

5) **Magnetooptic Materials** 19
Under the collaboration with Prof. T. Yamamoto, we measured Faraday rotation in pai-conjugated polymer and obtained remarkably large Verdet constant [19]. The materials can be applied to magnetic field sensors.

2. **List of publications (original article, comment/book)**

1) **Original Paper**


(10) Polarization-tunable electroluminescence using phase retardation based on photonic bandgap liquid


2) Review & Book

(1) Story of Liquid Crystal s –Exploring their mysterious behavior–; Hideo Takezoe: Nihon Kikaku Kyokai (2008, March)
3. Invited/Plenary Talks in Conference

1) International Conference or Workshop

(1) “Polymer Cholesteric Liquid Crystals for Photonic Devices”; Korea-Japan International Symposium on Polymer Nanomaterials: Jan. 28 to Jan. 31, 2008 (Daegeon, Korea) Invited

(2) “Tunable Lasers over Wide Wavelength Range”: International Symposium of Photonics and Electronics, from Fundamental to Device: April, 2, 2008 (Tokyo) Invited

(3) “Cholesteric Liquid Crystals for Photonic Devices”; International Liquid Crystal Conference: June, 29~July 4, 2008 (Jeju, Korea) Invited

(4) “Chirality in Liquid Crystals – Ester group, this unique chiral property!”; The 4th Japanese-Italian Workshop on Liquid Crystals: July 7-10, 2008 (Nara, Japan) Invited


4. Others

1) Award

(1) “Research on Banana-shaped Liquid Crystals”; The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology: April 15, 2008

(2) “Introduction to Liquid Crystal and Polymer” (Shokabo, 2004); Japan Liquid Crystal Award: Sep. 4, 2009

2) International Collaboration

(1) Jpn-Hungary collaboration research (JSPS)