

● Basic Stage

(Fiscal Year 2008–2010)

Mutsu-Ogawara and Hachinohe Area

Development of highly functional and efficient optical devices by applying technologies related to next-generation flat panel displays

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Framework for Project Promotion

- Project Leader ····· Kazuhiro Wako (Director of Research Institute for Advanced Liquid Crystal Technology of Aomori Support Center for Industrial Promotion)
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Core Research Organization

- Research Institute for Advanced Liquid Crystal Technology of Aomori Support Center for Industrial Promotion

Major Participating Research Organizations

- Industry ··· Research Institute for Advanced Liquid Crystal Technology of Aomori Support Center for Industrial Promotion, Tohoku Device Co., Ltd., Claro, Inc., Joy World Pacific Co., Ltd., Tohoku Chemical Co., Ltd.
- Academia ··· Kyoto Sangyo University, Tohoku University, Hachinohe Institute of Technology, Hachinohe National College of Technology, Hirosaki University
- Government ··· Hachinohe Technical Laboratory of Aomori Industrial Research Center

Aims of Project

In January 2001, Aomori Prefecture established “The Crystal Valley Plan,” aiming to establish a base for industries related to liquid crystal displays and other flat panel displays (FPDs) in the Mutsu-Ogawara and Hachinohe Area. As the central component in promoting this concept, the “Collaboration of Regional Entities for the Advancement of Technological Excellence in Aomori Prefecture” was implemented for five years from 2001. This earlier research project succeeded in developing a new type of high-grade and low-power-consumption liquid crystal display (OCB-Mode field sequential color type) without the need for a color filter. Since completion of the project, progress has been made in the practical application of this technology.

The development of this new type of liquid crystal display has contributed to the development of liquid crystal filter technologies and property- and optical-simulation technologies. Utilizing these technologies, the current project addresses the development of white organic EL devices and other highly functional and efficient optical devices to improve the technical capabilities of the companies concentrated in the Mutsu-Ogawara and Hachinohe Area, as well as other FPD-related companies in the prefecture, and thus promote FPD-related industries in the prefecture and advance The Crystal Valley Plan.

Contents of Project

1. Development of next-generation highly functional and efficient white organic EL devices

Ultra-high intensity, high efficiency, long service life, and low cost are demanded for organic EL devices to be used for surface-emitting light sources and illumination. However, due to their complicated multi-layer structures, the practical application of organic EL devices requires (i) clarification of the light-emitting mechanism by detailed analyses of electron/hole behaviors in multiple layers, (ii) the establishment of evaluation techniques for high-precision material of property and optical parameters, and (iii) consistency between theoretical and actual measurements. These requirements have not been satisfied to date, and repeated trials and evaluations have resulted in excessive investments of time, human resources, and money. This research will analyze the light-emitting mechanism of organic EL devices and identify factors that affect light emission by applying quantum mechanics, and will establish a device simulator and an optical simulator to optimize the device structure. We will also establish high-precision evaluation techniques and develop organic EL devices for next-generation highly functional and efficient illumination.



White organic EL device

2. Development of highly functional and efficient variable-wavelength filters, and imaging spectroscopic analysis techniques

In recent years, spectroscopic image analyses have been required in many fields, leading to strong demands for the practical application of compact, easy-to-use, and high-precision imaging spectroscopic filters. Liquid crystal variable-wavelength filters are expected to be the best devices to meet these needs, as they can be electrically controlled to set to any transmission wavelength while maintaining image information, and can achieve spectroscopic extraction in a short time and with a high degree of accuracy. This research will further improve the transmission factor and other functions, and the efficiency of existing liquid crystal variable-wavelength filters to meet the requirements of imaging spectroscopic analyses. We will also develop a signal-intensity quantification algorithm and a feature-extraction algorithm using the spectroscopic image information obtained from liquid crystal variable-wavelength filters, with the aim of establishing a next-generation, integrated, highly functional imaging spectroscopic analysis system, with applications to a fluorescence virtual-slide-creation system.



Liquid crystal variable-wavelength filter



Fluorescence virtual-slide-creation system

