February 5, 2013
Toyobo Co., Ltd.

Polyester Film Developed that Uses the Features of LED Light Sources to Eliminate Interference Fringes (Rainbow *Mura*)

Through joint research with Professor Yasuhiro Koike of Keio University, Toyobo has developed COSMOSHINE®, a polyester-based super retarder film (SRF) [*1] that eliminates interference fringes (rainbow *mura)*[*2].

1. Background for the Development of COSMOSHINE®

Toyobo previously developed and marketed COSMOSHINE®, an optical film used as the base film in LCDs.

In addition, as the backlight source for LCDs has shifted to LEDs, Toyobo has conducted joint development activities with Professor Yasuhiro Koike of Keio University with the concept of "combining the features of LED light sources and SRF technology to create LCDs that have not existed previously" with the aim of developing films with new functions.

COSMOSHINE® (SRF type) is a new kind of film made possible by a contrarian concept that overthrows existing common knowledge that held that materials {other than polarizer materials[*3] used thus far in LCDs must be isotropic[*4] (with birefringence = 0) }.

Going forward, Toyobo will work to develop the market for COSMOSHINE® not only as a base film for LCD backlight materials but also as a material for LCD units.

2. Features of COSMOSHINE® (SRF Type)

(1) Although it is an oriented film, COSMOSHINE® eliminates coloration (rainbow *mura)* due to birefringence.
(2) COSMOSHINE®converts the polarized light given off from LCDs more closely to natural light.
(3) COSMOSHINE® has superior adhesive properties for combining with various other materials.

3. Principal Uses

(1) As protective film for PVA polarizers
(2) Various base film materials for touch panels
(3) Films that improve the visibility of LCDs (usable with polarizing sunglasses)

Image showing a comparison of LCD visibility

The LCD is outfitted with SRF.

4. Production System

Equipment currently in use by Toyobo for optical film production can be modified to manufacture COSMOSHINE®. Last year, Toyobo converted one production line at its Inuyama Plant, one of its main film production facilities, and switched to mass production. Output of one production line is approximately 10 million m^2/month.

It will be possible to further increase production capacity in line with market trends.

5. Outlook

Toyobo will aim for annual COSMOSHINE®sales of ¥15.0 billion in 2015.

Notes:
*1: SRF has superhigh retardation, on the order of about 10,000 nanometers, much higher than previous films, which have retardation between 1,000 and 3,000 nanometers.
*2: Rainbow *mura* is a phenomenon in which color unevenness, similar to that of a rainbow, appears, because of birefringence of the material. When rainbow *mura* appears, the quality of the image deteriorates.

*3: Polarizers are a material that convert natural light into linearly polarized light.
*4: Materials that have isotropic properties (retardation=zero) do not exhibit birefringent properties.

Supplementary Information

Profile of Professor Yasuhiro Koike, Keio University

Current position: Professor of the Faculty of Science and Technology, Graduate School, Keio University

Fields of specialization: Photonic polymers, including high-speed GI-type plastic optical fiber; high-brightness, light-scattering optical guiding polymers; zero-birefringence polymers; high-output polymer optical fiber amplifiers; lasers; and dispersal-type polymer lenses for index of refraction

Research activities:
2000 to 2006: Overall responsibility for the Koike Photonics Polymer Project of the Exploratory Research for Advanced Technology (ERATO) of the Japan Science and Technology Agency

October 2005 to March 2011: In charge of overall research for “Photonics Polymers for Fiber to the Display,” ERATO-SORST (Solution Oriented Research for Science and Technology) Development Research of the Strategic and Creative Research of the Japan Science and Technology Agency

March 2010 to the present: Funding Program for World-Leading Innovative R&D on Science and Technology, Cabinet Office, with many research workers, engaging in projects related to “Creation of Face-to-Face Communication Industries through the Use of Photonic Polymers for the Fastest Plastic Optical Fibers and High-Definition, Large-Screen Displays in the World”

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