

# Material to Future

Guide to  
Tsuruga Research and Production center,  
TOYOBO CO.,LTD.

## TOYOBO

Tsuruga Research and Production Center,  
TOYOBO CO.,LTD.

10-24, Toyo-cho,  
Tsuruga-shi, Fukui  
914-8550, Japan  
TEL: +81-770-22-7600  
<https://www.toyobo-global.com/>



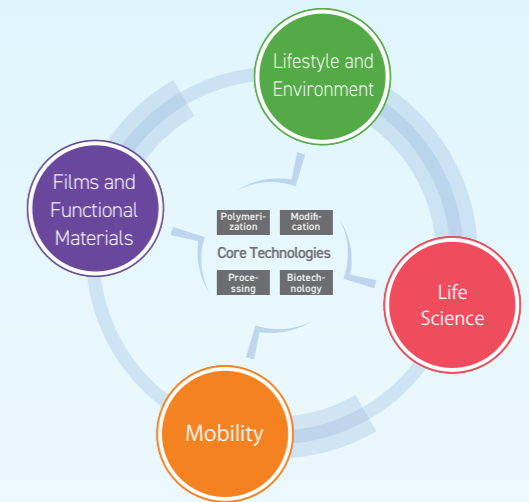
# Welcome to Tsuruga Research and Production Center – Creating the Future

The comfortable and secure life you envision is born here.

TOYOB0's Tsuruga Research and Production Center started in 1934 with the production of rayon and has since changed with the times to produce films, bioproducts and high-functional products. It has now grown as a base for high-functional products and forms a key business base for our company with structures covering all processes from research and development to production. What is required now is functionality that has previously unknown value to create the future. We will continue to pursue the possibilities for materials in order to realize a more comfortable, secure and sustainable society.

## The four Solutions and core technologies of the Tsuruga Research and Production Center

We use a new technology system that combines our core technologies to commercialize new products and to accelerate the creation of new specialty businesses.



**Automotive** Resin for automotive parts



**Automotive** Airbag fabrics



**Firefighter garment** Highly heat resistant fibers



**Hospital** Material enzymes for in-vitro diagnostics



**Medical and research institutions** IVD medical devices



**TV, PC, and smartphone** Films for liquid crystal displays



**Beverage** Labels for PET bottles



**Beverage** Packaging material Recycled PET films



**Marine vessels** Mooring rope



**Building materials** Nonwoven fabric for building roof waterproofing



**Train** Cushion material for seats



**Fishing line** Ultra-high-strength polyethylene fiber

# Films and Functional Materials

**We focus on providing new value, including environmentally friendly products. We also becoming the world's No. 1 "green" film manufacturer and comprehensive plastics provider.**

## Packaging films

**Biaxially oriented polyester film "TOYOBOESTER® Film"**

This is a film made with biaxially stretched polyester. It has excellent heat resistance, dimensional stability, transparency and machinability. It is used for a wide range of applications, including industrial materials and general packaging.



**Shrink film "SPACECLEAN®"**

At 20 µm, "SPACECLEAN®" heat-shrinkable film is the world's thinnest polyester film. This is less than half the thickness of conventional products and contributes to significant resource conservation.



**Film of Recycled PET film "CYCLE CLEAN®"**

"CYCLE CLEAN®" recycled PET film retains the transparency and strength of conventional products while increasing the ratio of recycled resin to a world-leading 80%.



## Industrial films

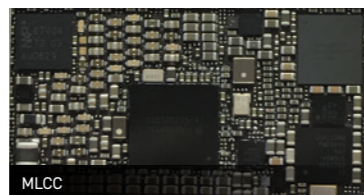
**Super retardation film "COSMOSHINE SRF®"**

COSMOSHINE SRF® polarizer protective film for LCDs is a product that eliminates the coloration caused by birefringence seen in conventional polyester. With the increasing size of LCD TVs and the shift to bezel-less screens, this product has gained a large market share.



**Moldreleasing film for MLCC "COSMOPEEL®"**

"COSMOPEEL®" mold-releasing film is a film with excellent smoothness, and it is used for high-end ceramic capacitors that support the spread and development of IoT and 5G communications. We are able to manufacture this film in an integrated process that covers everything from production of the raw film to coating of the releasing layer.



**PET based synthetic paper "Crisper®"**

This is a white opaque biaxially oriented polyester film that has voids inside. It is an environmentally friendly synthetic paper that is made using recycled materials, including recycled PET bottles, and also achieves a lighter weight.



**Airbag fabrics**

TOYOBO's airbag fabrics have been manufactured utilizing our state-of-the-art spinning, weaving and coating technologies for a line-up of products that is ranging from non-coated fabrics to a variety of coated fabrics. Our airbag fabrics are lightweight and compact, and they are trusted globally for their high quality and excellent characteristics.



**Polyester resin for injection molding "VYLOPET®"**

"VYLOPET®" is a thermoplastic polyester resin for injection molding. This product has excellent heat resistance, rigidity, chemical resistance as well as electrical properties. It is widely used in automobile parts, electrical/electronic parts and mechanical components.



**Biomass polyamide resin "VYLOAMIDE®"**

"VYLOAMIDE®" biomass high-melting-point polyamide is made from the non-edible castor oil plant. One of its features is that it has a melting point of 315°C, giving it the highest melting point compared to conventional high-melting-point polyamides. It also has excellent dimensional stability due to its low water absorption.



**High-Performance Polyamide Resin "GLAMIDE®"**

"GLAMIDE®" highly functional polyamide resin contains 70% reinforced fibers, far exceeding global standards. This gives it sufficient strength as an alternative to metals, contributing significantly to weight reduction.



**We meet the expectations of society and the market by improving environmental performance and safety through the integration of the TOYOBO Group's materials and technologies in each field.**



**Three-dimensional cushion material  
"BREATHAIR®"**

"BREATHAIR®", three-dimensional spring structure, is used in bedding and car seats due to its excellent air permeability, cushioning properties, water permeability and durability. It also has bacteriostatic properties and is used in hospitals and nursing care.



Photo courtesy of JR Central

**Spunbond nonwoven fabrics**

Spunbond, functional nonwovens made from polyester, are used in a variety of applications, including automotive, construction and civil engineering work, packaging and sanitary products. These contribute to environmental conservation and reduction of environmental impact in various aspects, as soil pollution prevention.



**Ultra-high-strength polyethylene fiber  
"IZANAS®"**

"IZANAS®" is a super fiber made from ultra-high molecular weight polyethylene. It's made by a unique gel spinning method and has high strength and high elastic modulus. Also it is light enough to float on water. These characteristics is useful in many fields, including fishing lines, protective clothing, and mooring ropes for large ships.



**High strength polyethylene fiber  
"Tsunooag®"**

"Tsunooag®" is a high-strength fiber made from high molecular weight polyethylene. It's made by a melt spinning method. It has excellent durability against water, light as well as chemicals, and can be colored. TOYOBO promote it for use of cut-resistant gloves, we are also working to developing new applications for this material.



**The strongest PBO fiber with amazing flame resistance  
"ZYLON®"**

"ZYLON®" is an "ultra" super fiber that has the highest strength and elastic modulus in the world\*. It also boasts the highest levels of heat resistance and flame retardancy. It is used in cutting-edge fields, including applications in the aerospace industry and sports.

\*Comparative Data on Existing Organic Fibers (According to a survey conducted by Toyobo in May 2015)



**With biotechnology and membranes as our core technologies, we provide unique products that are unmatched by other companies. And we contribute to the development of medical care as well as the improvement of QOL (quality of life).**



**Raw material enzymes for in-vitro diagnostics**

Enzymes, which are highly functional materials derived from living organisms, are used in clinical settings as biochemical and genetic testing agents. We are also developing high-performance materials other than enzymes to meet increasingly advanced medical needs.



**IVD medical devices**

We contribute to better medical care with our "USCANNER®(E)" urine sediment analyzer and "GENECUBE®" automated genetic analysis system, which performs fully automatic measurement throughout the genetic analysis process from sample pretreatment to gene amplification and detection.



**Reagents for life science research**

We support doctors and researchers engaged in cutting-edge research in medical and life science fields such as gene research, genome drug discovery, and antibody drug development by providing reagents for life science research such as gene amplification (PCR) reagents and high expression vectors.



**Raw materials for cosmetics**

Our company has developed technology to efficiently produce raw materials for cosmetics, including natural moisturizing ingredients that are mild on the skin and reducing environmental impact on the earth, as well as highly biologically active ingredients, including polyamines. The cosmetics industry has high expectations for this technology.



**Lifestyle and Environment**

**We use our original technologies to address global issues such as climate change, air pollution and water shortages.**



## Affiliated company

Xenomax-Japan Co., Ltd.

### Manufacturing of highly heat-resistant films with the world's highest dimensional stability

We established Xenomax-Japan Co., Ltd. in a joint venture with Nagase & Co., Ltd. The company commercialized the "XENOMAX®" polyimide film, which has heat resistance and dimensional stability\* at the highest level in the world, and constructed a production plant within the Tsuruga Research and Production Center. The film is being developed as a substrate material that can replace glass, silicon wafers and ceramics, for applications such as electronic paper displays, organic EL displays and various sensors

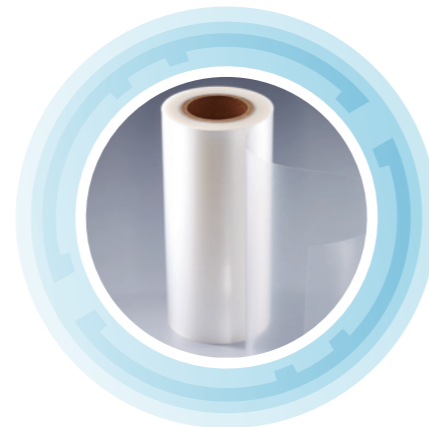
\*Dimensional stability: The property that a dimensional (size) change is not likely to occur on a substance (material) due to temperature change.



Cast Film Japan Co., Ltd.

### Manufacturing of casted films used widely in food packaging applications

Cast Film Japan Co., Ltd., is a joint venture with DIC Corporation. It uses polypropylene and polyethylene as raw materials for the manufacturing of films for food packaging, such as for confectionery, bread, rice seasoning and dried foods, and films for industrial applications. The "PYLEN® Film" (polypropylene) has excellent transparency, gloss, heat resistance and moisture resistance, etc., and the "LIX® Film" (polyethylene) has excellent heat sealing performance, chilled usability and rupture resistance. These products have been selected by a large number of customers.



We have concentrated core technologies of TOYOBO at two sites and we are promoting research, development and production for the future in each field.

Production Department

Research and Development Department

- Tsuruga Functional Materials Plant
- Tsuruga Polymers Plant
- Tsuruga Films Plant
- Tsuruga Biochemicals Plant

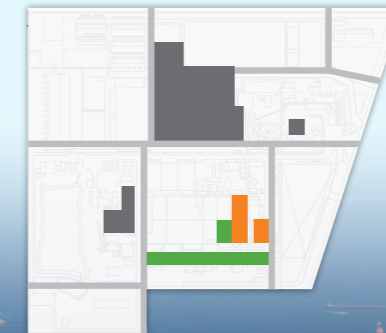
- Polymer Development Center
- Tsuruga Films Technology Center
- Biotechnology Research Laboratory

#### Site map

Tsuruga Research and Production Center No. 2



Tsuruga Research and Production Center No. 1



Tsuruga Research and Production Center No. 2

Tsuruga Research and Production Center No. 1

We will continue to walk together with Tsuruga City for the development of society and the local community.

### From 1933

Starting from rayon fibers

#### 1882

Osaka Boseki, the predecessor of TOYOBO, is founded by Eiichi Shibusawa

#### 1914

TOYOBO is established through the merging of the Osaka Boseki and Mie Boseki

#### 1933

Showa Rayon Co., Ltd. constructs a plant in Tsuruga (Currently: Tsuruga Research and Production Center No.1)

#### 1934

TOYOBO merges with Showa Rayon and begins the production of rayon fibers as the TOYOBO Tsuruga Plant



Eiichi Shibusawa



1933 Construction of the Tsuruga Plant

### From 1960

The rise of synthetic fibers

#### 1963

Production of "ESPA®" spandex yarn begins

#### 1964

The Tsuruga Nylon Plant, Kureha Boseki Co., Ltd. is established (Currently: Tsuruga Research and Production Center No.2) and nylon fiber production begins

#### 1966

A merger with Kureha Boseki means that the plant becomes the TOYOBO Tsuruga Nylon Plant

#### 1967

Production of polyester filament begins

#### 1969

Production of the promix fiber "Chinon" begins



1964 Tsuruga Nylon Plant

### From 1970

Expansion of business other than fiber

#### 1973

Suspension of rayon tire cord production

#### 1976

TOYOBO Spunbond's Tsuruga Plant begins operations

#### 1978

Establishment of the Tsuruga Enzyme Plant (Currently: Tsuruga Biochemicals Plant)

#### 1981

Establishment of the Tsuruga Film's Tsuruga Plant

#### 1984

Nippon Magphane's Tsuruga Plant begins operations (Currently: Tsuruga Films Plant)



1973 In-house magazine



1982 Construction of Nippon Magphane's the Tsuruga Plant

### From 1990

Pursuit of highly functional products

#### 1992

Establishment of the Tsuruga Institute of Biotechnology (currently:Biotechnology Research Laboratory)

#### 1993

Production of nylon fiber for airbags begins

#### 1996

Production of three-dimensional cushion material "BREATHAIR®" begins

#### 1998

Production of PBO fiber "ZYLON®" begins

#### 2002

Reorganize the plants in the Tsuruga area as the Tsuruga Research and Production Center

#### 2003

Production of the "Dyneema" ultra-high-strength polyethylene fiber (currently:"IZANAS®") begins



Biotechnology Research Laboratory

### From 2010 ~

Taking on the challenge of possibilities

#### 2012

130th anniversary of TOYOBO

#### 2014

Super-large scale production facility operation started at the Tsuruga Films Plant

#### 2015

Establishment of Cast Film Japan Co., Ltd. (Merger of Tsuruga Film Co., Ltd. and DIC Filtec Inc.)

#### 2018

Establishment of Xenomax-Japan Co., Ltd.

#### 2019

85th anniversary of Tsuruga Research and Production Center

New construction and operation of processing facility for mold-releasing film for MLCC (ceramic capacitors)



Tsuruga Films Plant

### Changes in Tsuruga City

#### 1937

Tsuruga Town and Matsubara Village are merged to form a city

#### 1945

Bombing of Tsuruga(100 or more deaths) Simulated atomic bomb drops on the Tsuruga plant

#### 1955

Merge with five surrounding villages to form the current Tsuruga City

#### 1970

Tsuruga Atomic Power Plant begins commercial operations

#### 1975

The Japanese National Railways Kosei Line is fully opened

#### 1980

The Hokuriku Expressway between Tsuruga and Maibara is opened

#### 1999

100th anniversary of opening of Tsuruga Port

#### 2014

The Maizuru-Wakasa Expressway is fully opened

#### 2018

The 73rd National Sports Festival is held in Fukui Prefecture

We aim to create a workplace environment where employees can work in a lively manner and we are striving to create a safe environment and improve our welfare and education systems.

### Environment, safety and disaster prevention

At the Tsuruga Research and Production Center, we are working in accordance with the Center policy of "Safety First" and engaging in occupational safety and environmental disaster prevention activities on a daily basis. The aim of these is to create a safe and comfortable working environment for our colleagues and to reduce the risk of environmental accidents in the vicinity of the Center.

#### Labor safety activities



We are promoting a "Let's watch over others campaign" to raise the safety awareness of workers through the enforcement of "Keep safety!" by using the protective equipment appropriately, and by pointing and calling before starting work. In addition, we are implementing "Risk assessment activities" where we quantify and evaluate the work risks at worksites and we are promoting measures to ensure intrinsic safety with an emphasis on equipment measures.

#### Environmental disaster prevention activities



We are working to protect the environment by reducing the substances of concern emitted from our production sites and by producing environmentally friendly products. We are also promoting safety and disaster prevention by inspecting our equipment and work methods to prevent fires, explosions, spills and other accidents from occurring at our production sites. We have organized a self-defense organization for disaster prevention and conduct disaster prevention drills so that we can suppress disasters.

### Facilities and system for employees benefits



We have a bright and open cafeteria as well as company housing and dormitories. We also have many facilities for physical exercise, including a gymnasium, tennis courts and sportsground. In addition to club activities such as soccer, basketball, tennis and baseball, we also hold many in-house events such as cherry blossom viewing and summer festivals.

### Personnel education system

We continuously support employee growth by providing continuing education and follow-up interviews after employees join the company.



We have established systems that make it easier for employees to work and are registered as a "Company promoting women's activity in Fukui."

