

Kanagawa Pref. Industry-Academic-Public Sector Cooperative Project Environmental-Friendly functional surface project

Research period: April 2006 to March 2011

Overview

- With support from the industry-academic-government collaborative promotion business (sponsored by the Ministry of Education, Culture, Sports, Science and Technology), Kanagawa prefecture and KAST launched the “Environmental-friendly functional surface project,” which is a collaborative project of industry, academy, and the public sector.
- In this project, responses to social demands in **environmental issues** that must be addressed by the “**surface treatment**” industry, such as metal plating, and particularly to related European regulations are considered good opportunities to enhance international competitive strength. For this season, surface treatment technologies that have new added values in both functional and cost aspects will be developed and applied to practical manufacturing technologies.
To achieve this goal, in addition to the research activities of KAST and KITC in collaboration with universities and businesses, the “**Public Laboratory Function for Prototype Development**” has been established to support prototype development by businesses and develop industry-academic-government collaborative activities for responding to the needs of the small-to-medium-sized local businesses.
- This project operates the “Environmental-friendly Surface Society (Eco-surface Society)” to encourage the participation of many businesses in the project.

* This project is being promoted as one of the core efforts made based on the “Kanagawa R&D Network Concept” that encourages technical collaboration and cooperative research among small-to-medium-sized businesses, large companies, universities/colleges, and public research organizations in the prefecture. The Concept also includes the establishment and expansion of research institutes by “Invest Kanagawa”



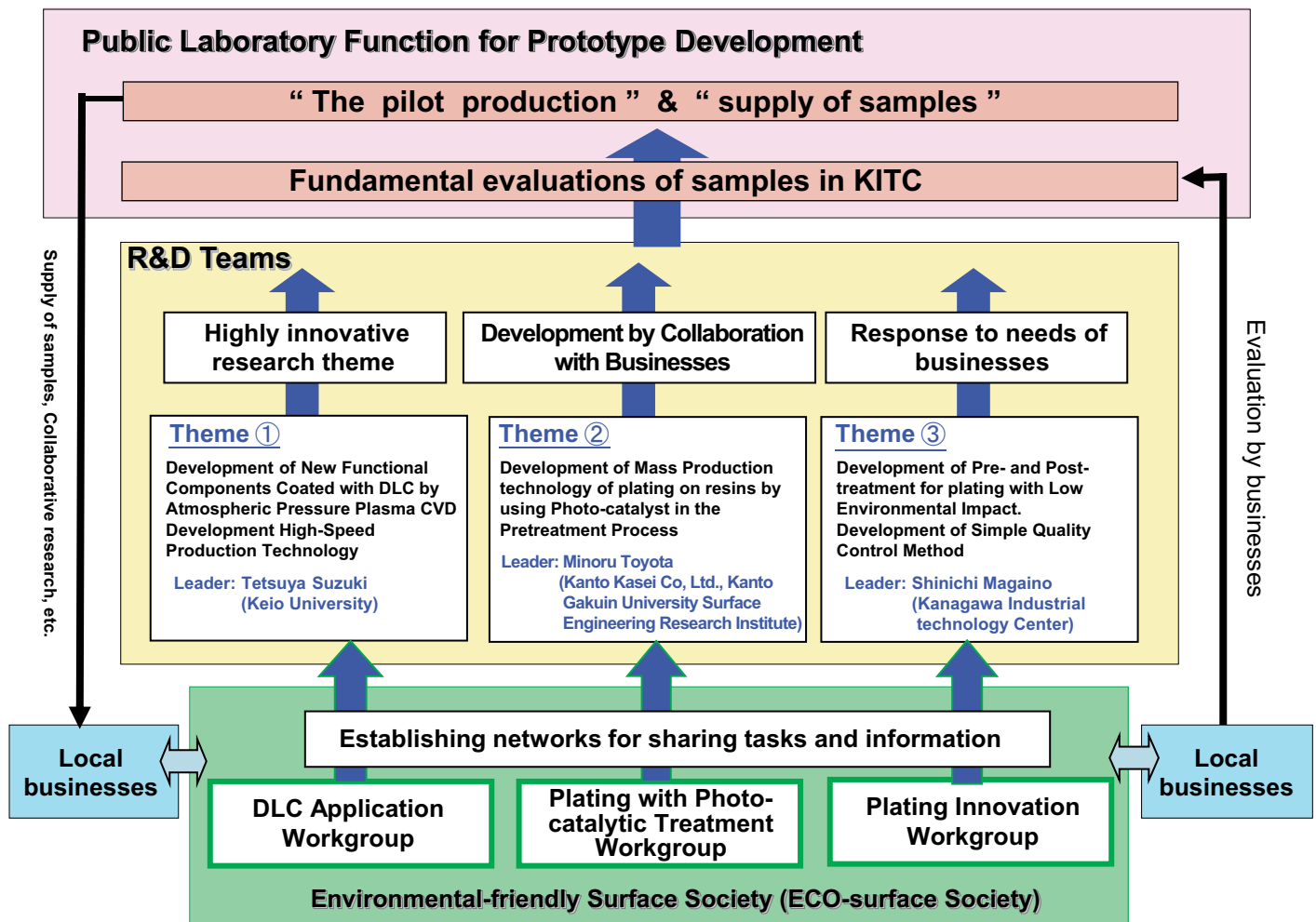
Organization

Director General : Shinichi Magaino (Director of Kanagawa Industrial Technology Center [KITC])

Research advisor : Prof. Hideo Honma (Kanto Gakuin University)

Core organization : Kanagawa Academy of Science and Technology (KAST)

Research organization : Kanagawa Industrial Technology Center, Keio University Faculty of Science and Technology, and Kanto Gakuin University Surface Engineering Research Institute



Research theme 1 *Leader: Prof. Tetsuya Suzuki (Keio University Faculty of Science and Technology)*
Development of New Functional Components Coated with DLC by Atmospheric Pressure Plasma CVD Development of High - Speed Production Technology

DLC thin film offers high functionality in terms of hardness, lubrication, and gas barrier properties, while having low environmental impact. This research is being conducted to develop both the technology and device for practical use, to coat a diamond-like carbon film under atmospheric pressure. And it establishes trial production lines of “Public Laboratory Function for Prototype Development” for the local businesses. Furthermore, this research seeks to reduce environmental impact through low frictional sliding components included in automotive engines.

Sub-theme 1: Development of High-Speed DLC coating Technology for Large Film using High-Frequency Pulsed Plasma CVD under Atmospheric Pressure Method

A high-speed and large DLC films coating device will be developed by using the high-frequency pulsed plasma CVD under atmospheric pressure. The device is optimized as an inexpensive and practical manufacturing technology, which offers high productivity.

Sub-theme 2: Development of High-Speed DLC coating Technology on Complex Shaped components using Atmospheric Pressure Microwave Plasma CVD Method

In order to coat DLC film on complex shaped components of metal and resins at low cost and with high efficiency, a device will be developed by using the atmospheric pressure microwave plasma method. It will be established the technology for manufacturing materials with high-functional surfaces.

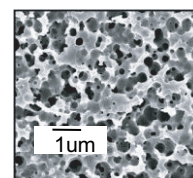
Sub-theme 3: Development of DLC Film coating Technology on Light Alloys and Resin materials for High Durability and Extremely Low Sliding Friction

The DLC film coating technology on light alloys and resin materials will be developed for high adhesiveness, wear resistance, and an extremely low frictional property. Manufacturing processes is established, that meet the requirements for automotive components, etc.

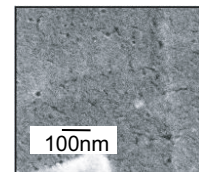
Research theme 2 *Leader: Minoru Toyota (Kanto Gakuin University Surface Engineering Research Institute)*
Development of Mass Production Technology of Plating on Resins by using Photo-catalyst in the Pretreatment Process

At conventional method of plating on resin, chromic acid have been used in the pretreatment process to create fine uneven surfaces. This research utilizes the photocatalytic reaction of titanium dioxide to make a chemical bond and nano-scale anchor effect on resins surface. This treatment enables a plating on resin with high adhesiveness without roughening the base material surfaces. This research establish a plating pretreatment method that has low environmental impact and can be applied to various types of resin materials.

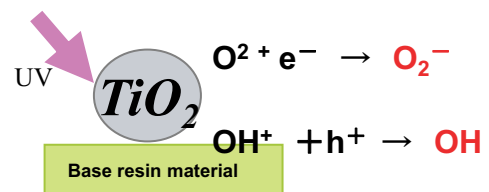
Furthermore, this method will be established as a mass production technology for the “Public Laboratory Function for Prototype Development” that supports the prototype development stage in the small-to-medium-sized local businesses.



Surface of resin with conventional method



Surface of resin with method developed in this research



Research theme 3 *Leader: Shinichi Magaino (Kanagawa Industrial Technology Center)*
Development of Pre-and Post-treatment for plating with Low Environmental Impact. Development of Simple Quality Control Method

This research will grapple with environmental issues of the plating industry in collaboration with the Kanagawa Pref. Plating Industry Association in a pioneering approach. Technologies will be developed that can be easily introduced to small-to-medium-sized businesses without having to change their existing plating production lines.

Sub-theme 1: Development of Pretreatment Technology with Low Environmental Impact

Pretreatment for plating will be developed with low environmental impact, while optimizing the conditions for removing fat washing by acid

Sub-theme 2: Development of Chromium-free, Highly Anti-Corrosive Film using Water Repellency

A protective film will be developed using the sol-gel method, to be created in post treatment of plating chromium-free, highly anti-corrosive film with water repellency

Sub-theme 3: Development of Simple Measuring Devices for Quality Control in the Plating Process

Measuring devices will be developed for enabling quantitative quality control of the plating gloss level using optical sensors. Inexpensive measuring devices will be developed to facilitate the control of the plating bath, etc.