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General Manager
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Functional Materials

Basic Policies of the 2018 Medium-term Management Plan

Strengthen key businesses through Niche and Cluster Strategies

Strengths
- A wide array of material technologies
- Product functions and design excellence of product forms
- Semiconductor packaging materials, process technologies and state-of-the-art simulation evaluation facilities
- Ability to offer proposals suited to customer needs

Weaknesses
- Delay in taking actions toward the diverse needs by overemphasizing the self-sufficiency principle
- Dispersion of development/marketing resources through multi-axial deployment of businesses

Opportunities
- Expansion of markets for electrification, 5G and automatic driving
- Growth in the semiconductor package market
- Increase of highly functional adhesives and anode materials in the automotive market

Threats
- Increased competition (products, services, and prices) in main product areas
- Rise in the risk of slowed growth in Chinese economy

M&A/Alliance strategies

The Functional Materials Business will focus on “expanding alliances across the entire value chain” and “gaining global competitive advantage through increased scale,” and will acquire technologies, business platforms and foundations from outside resources.

ROIC (FY2017)

29.8% (FY2018 Target: 27%)

ROIC is managed by referring to the ROIC of our competitors. We plan to further improve our ROIC going forward.

Fiscal Year 2017 Progress

In Niche products, we expanded sales of nanoceria slurries to contribute to the miniaturization of semiconductor devices. The nanoceria slurries use finer abrasive grains than those of conventional products and boast a technological advantage that no other company can imitate. They are increasingly applied to the most advanced area of semiconductors, a growing product category. QD (quantum dot) films, a new product, match the market needs for compatibility between high definition and the reduction of environmental burdens. Our QD films were introduced to next-generation 4K and 8K displays. In the Cluster businesses, great demand is expected in highly functional laminate materials for semiconductor devices and modules for use in AI, automatic driving and 5G (next-generation radio technology), among others. Therefore, we decided to construct a new plant for copper-clad laminates for printed wiring boards at HCET, our subsidiary. This is intended to prepare for the establishment of a supply system. Furthermore, the Open Laboratory for Semiconductor Packaging Materials is increasingly gaining industry recognition and cooperative projects with clients, material manufacturers and device manufacturers are gradually expanding. Therefore, we decided to relocate the Open Laboratory to Shin-Kawasaki (Kawasaki-shi, Kanagawa), a convenient area in terms of transportation, in an effort to streamline research and development.

Total solutions through the collaborative project to create next-generation semiconductor packaging

Process	Chip lamination			Sealing				Debonding	Circuit formation		
Equipment / Materials	Mounter	Temporary fixing material	Carrier	Mold	Grinder	Molding compounds	Mold release film	Debonder	Exposure system	Photosensitive dry film	Insulating film
Hitachi Chemical	—	○		—	—	○	○	—	—	○	○
Business partners (Materials/ Equipment)	○	○	○	○	○	○	—	○	○	—	—

Key Measures for Fiscal Year 2018

Strengthen key businesses through Niche and Cluster Strategies

In Niche products, we will focus on growing fields in an effort to achieve further growth. The recent rise in demand for high-density semiconductor devices led to a rising need for nanoceria. The capacity of our production facilities in Japan and Taiwan will be reinforced so that our mass production capacity grows five times larger.(The facilities started operating in the summer of 2018.) In this way, we will proceed

HCET
Hitachi Chemical Electronic Materials (Taiwan) Co., Ltd.

PAL-ACF
Stands for particle-aligned anisotropic conductive film developed by Hitachi Chemical, it can help to refine flat panel displays.

xEV
Collectively means EVs, hybrid cars and plug-in hybrid cars.

Outputs and Strategies of the 2018 Medium-term Management Plan

FY2017 Progress	Initiatives for FY2018	Goals for FY2018	Goals for the 10-year Strategy
Niche products		**Niche and Cluster Strategies that take advantage of M&As and alliances have had impact, and business is expanding at a pace exceeding the market growth rate.**	**Establish top-class profitability and scale, and become a functional materials manufacturer with a global presence**
Anisotropic conductive films			
• Opened Integration Lab in Suzhou, China to increase our market share • Received orders for high-definition displays in PAL-ACF	• Set up an evaluation facility in Chongqing, China to capture demand in China • Beat competitors to increase our market share in advanced fields	**Niche products** global top share has been maintained and expanded by erecting higher barriers for entry	• Expand highly profitable businesses in growing markets (including M&A)
CMP slurries			
• Increased sales of nanoceria slurry that enables micro semiconductor devices	• Expand nanoceria slurry production capacity by 5 times (in Japan and Taiwan)		
Carbon anode materials for lithium-ion batteries			
• Captured strong demand for xEV	• Build a supply system to capture growing global demand		
Cluster businesses			
Semiconductor packaging materials		**Semiconductor packaging materials** de facto standardization is achieved in next-generation packaging technology through collaborative creation using outside resources	• Capture the overwhelming No.1 position in semiconductor packaging materials
• Proposed and adopted new packages based on open lab strategies • Accelerate development collaboration with customers, material suppliers, and device manufacturers	• Relocate Packaging Solution Center improve its function • Continue acceleration of development collaboration with customers, material suppliers, and device manufacturers		
High functional resins		**High functional resins** adhesives and insulating varnishes have entered the U.S. and European markets and sales have increased	• Become one of the world's top-class manufacturers of high functional resins
• Focused on the growth area of automotive application to boost sales	• Maintain focus on automotive application for business expansion on a global basis • Build a development center for plastic products in Johor, Malaysia to strengthen our ability to capture demand in Asia		

with sales expansion on a global scale. Our QD films will be increasingly introduced to 4K and 8K displays and their sales will therefore expand.

Hitachi Chemical has a wide selection of semiconductor packaging materials to the extent they can provide an overview of the semiconductor packaging process. We boast the top share of such materials in the industry. To strengthen our advantage, we will aggressively push forward by cooperating with outside resources through the strengthened function of the Open Laboratory, and will establish a process for new semiconductor packages. Also, we will continue to discuss and consider the launch of a new project using open innovations such as M&A and alliances with other companies.

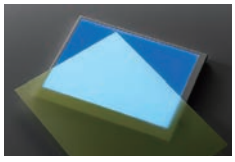
Strengthening our capabilities to create customer-tailored proposals through our Open Laboratory

The Packaging Solution Center of the Open Laboratory has the most-advanced equipment and evaluation devices for use in the back-end process of semiconductor manufacturing. Engineers of our customers, device manufacturers and material manufacturers can work together in the Laboratory to experimentally make and evaluate new semiconductor packages. We will serve as a solution provider in the development of processes, for example, by making proposals on optimal combinations of packaging materials for different processes and on the use of the packages, including the process conditions. In this way we will strive to establish an unshakable position in the industry.

Product examples

Materials that may contribute to the enhancement of QOL and the realization of a sustainable environment

Using the most advanced material technologies, Hitachi Chemical develops products that will help to solve many different problems. For example, 4K and 8K displays are expected to have a wider range of color. This can be achieved using Hitachi Chemical's QD films without increasing the consumption of electric power. There is large market potential in China, South Korea and other Asian countries, all of which are the main target of the TV market. Also, Hitachi Chemical launched Hitachi Wrap—Blue Type, commercial-use wrap that is designed to be easily distinguishable to identify any film pieces mixed in with food. Subsequently, three-color wrap with characters from the popular picture book Barbapapa launched in April 2018 to provide consumers or households with greater fun in their kitchen.



QD (quantum dot) film

Color Wrap with Barbapapa, food wrap film

Major Products

Anisotropic Conductive Films

These are wire connecting materials for displays. Both electrical conductivity and insulation property are achieved while these films connect batches of very small electrodes in micrometer order. Widely used in smart phones, LCDs and other devices, these films make higher definition images and smaller, thinner devices.

Nanoceria slurries

Nanoceria slurries are polishing materials for use in the circuit formation process for semiconductor devices. They are better able to reduce the polishing flaws on the semiconductor substrate than their conventional counterparts. Cracks and the disconnection of the circuit, which may result from such flaws, may also be prevented.

Conventional CMP slurries (left) and nanoceria slurries (right)

Carbon Anode Materials for Lithium-ion Batteries

Graphite materials are the keys to larger capacity and longer life of lithium-ion batteries. Our carbon synthesis technology and particle design technology gained in the development process of carbon brushes are used in the design of internal structures for efficient inward and outward movement of lithium ions.