Environment and Energy Conservation Field

“We will focus on the development of next-generation environmentally friendly products and products for energy conservation, as we create ‘growth-point businesses’ that can make best use of the Nippon Kayaku strengths.”

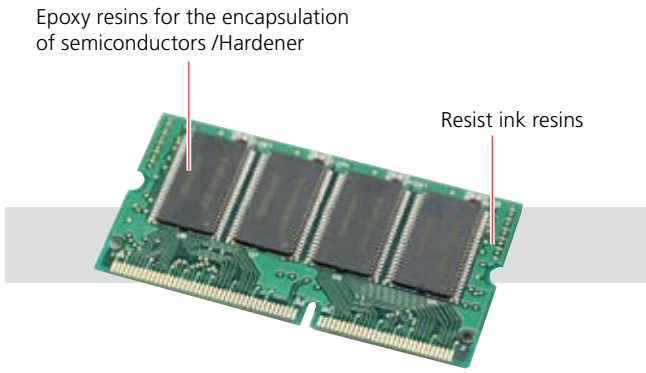
The areas of the Nippon Kayaku functional chemicals business include our functional materials business, electronic materials business, catalysts business, and color chemicals business. The functional chemicals business is focusing on the target field of environment and energy conservation, and we are working to create a business that can make best use of the Nippon Kayaku strengths in a rapidly changing market.

Tatsuya Numa
Member of the Board
Managing Director
Head of Functional Chemicals Group

Functional Materials Business

Business Overview

In the functional materials business, we develop, manufacture, and sell materials with a broad range of functions, including epoxy resins, UV-curing resins, and polyimide and polyamide resins known for their exceptional durability. These materials are used widely in many industrial applications, primarily in the electronics field, and in particular in the area of epoxy resins for semiconductor encapsulation our environmentally friendly NC-3000 and hardener KAYAHARD GPH have established positions as the *de facto* standards in the market. In addition, we also have developed and commercialized the KAYARAD ZCR Series of binders for the photo-curing resists used in flat panel displays and smart phones.



Overview of Operations for the Fiscal Year Ended May 31, 2011

Although our epoxy resins for semiconductor encapsulation were affected by customer production adjustments, the results were approximately the same as the previous fiscal year. Large growth was achieved by the environmentally friendly epoxy resins that are a major focus as one of our growth drivers in the mid-term business plan.

Electronic Materials Business

Business Overview

In the electronic materials business, we develop, manufacture, and sell high added-value materials such as optical functional films for plasma display panels (PDP), colors for inkjet printers, resins for optical discs such as DVDs and Blu-Ray discs, and liquid crystal sealants.

Our consolidated subsidiary Polatechno Co., Ltd. manufactures the special polarizing films that are essential for LCD displays. Because these polarizing films were developed using original Nippon Kayaku dye technologies, unlike the iodine-based polarizing films that are used for large-size LCD panels, these films are particularly suited to small- and mid-size panels in niche markets where high durability is required, such as automobile on-board displays.

Polarizing films for automobile LCD displays

Overview of Operations for the Fiscal Year Ended May 31, 2011

Sales grew of the growth driver products colors for inkjet printers and resins for optical discs. Sales of another growth driver product, Polatechno polarizing films for LCD displays, also grew. Sales were also higher of films for plasma display panels, a product positioned as a future growth engine.

LCD projector components

Liquid crystal sealants
Brightness-boosting sheets for LCD panels

Optical films used in PDP (plasma display panels)

Resins for Blu-ray Discs

Catalysts Business

Business Overview

In the catalyst business, we develop, manufacture, and sell catalysts that are used in the production of acrylic and methacrylic acid (direct oxidation method). Acrylic acid is used as a raw material in the production of SAPs (super absorbent polymers) that are used in disposable diapers and other products, as well as in acrylic paints for automobiles, adhesives, and RC resins. Methacrylic acid is used in LCD light-guide plates and other optical applications, in products such as transparent plastics for giant aquarium tanks, and in automotive parts and artificial marble. Nippon Kayaku catalysts have been highly rated by customers producing acrylic and methacrylic acid.

In this field, we are also making use of our catalyst-related expertise in business providing technical support to plants. Through this business, we provide technologies for the design and operation of plants that produce acrylic and methacrylic acid.

Overview of Operations for the Fiscal Year Ended May 31, 2011

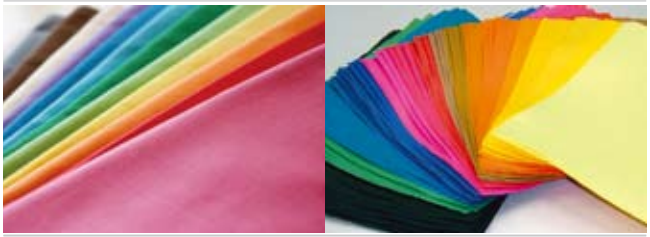
In the catalyst business, thanks to a recovery in demand there was large growth in sales of catalysts used in the production of acrylic acid—one of our growth driver products.

Color Chemicals Business

Business Overview

In the color chemicals business, we manufacture textile dyes that are used for textiles and car seats, and dyes used for paper pulp, and provide these products to the Japan market as well as to China and other overseas markets.

Nippon Kayaku dyes are characterized by their high quality, including high fastness, bright colors, and good color reproducibility.



Overview of Operations for the Fiscal Year Ended May 31, 2011

In the color chemicals business, we are focused on expanding operations in China, and our textile dyes delivered strong sales.

Efforts to Achieve the Targets of the Mid-Term Business Plan

Phase I (Fiscal Year Ended May 31, 2011–Fiscal Year Ending May 31, 2013)

Focusing on strengthening current growth drivers and developing growth engines for the next phase

In the Functional Chemicals Group, we are aiming to achieve the Phase I targets by focusing on strengthening the "growth drivers" that are driving our current business and developing the "growth engines" that will be the foundation for future growth.

Our growth driver products include environmentally friendly epoxy resins for semiconductor encapsulation and colors for inkjet printers that make use of our advanced dye synthesis technologies. In addition, the dye-based polarizing films that are manufactured by the Polatechno Group control the No. 1 share of the global market. The growth engine products that we are developing include new high added-value products such as high-performance LED sealants, functional adhesive sheets with high heat resistance for use in power semiconductors, and dye-sensitized solar cells.

Phase II (Fiscal Year Ending May 31, 2014–Fiscal Year Ending May 31, 2016)

Creating growth points for achieving the sales target of 100 billion yen

The Functional Chemicals Group is involved in large-scale projects targeting the field of environment and energy conservation, and is aimed at developing products and business models that make best use of the Nippon Kayaku Group strengths. Through these projects, we are working to create "growth points" for continual growth, aiming to achieve the Phase II target of 100 billion yen in sales.

Topics in the Environment and Energy Conservation Field

Strengthening our lineup of environmentally friendly epoxy resins from high-end to upper-middle markets

The Nippon Kayaku NC-3000 epoxy resin for semiconductor encapsulation has created a position as the industry *de facto* standard for environmentally friendly epoxy resins suitable for purposes such as lead-free semiconductors. In parallel with the NC-3000 series, Nippon Kayaku is expanding its lineup by introducing products such as NC-2000, which maintains the characteristics of NC-3000 but is offered at a lower price. In the future, we will expand sales of our green epoxy resin series, including the GPH environmentally friendly hardener, not only in the high-end market of next-generation materials for semiconductor encapsulation but also for the upper-middle market that includes resins for circuit boards and similar products.

Developing epoxy resin products with high added value as we accelerate the development of new growth markets

Nippon Kayaku is making use of the technologies that we have developed in the epoxy resin business to create new high added-value applications for epoxy resins by optimizing the resins together with the hardener. One such application is an encapsulation resin for light-emitting diodes (LED) using an original manufacturing method combining an alicyclic epoxy and hardener. The result is a product with improved heat resistance as well as no cracking and excellent sulfur resistance. The cost is also lower than silicon-based encapsulation resin. We have also succeeded in developing a new epoxy-based material with high refractive index by applying the technologies we have developed through our LED encapsulation resins. The highly transparent epoxy not only allows lighter-weight products than with glass, it is also compatible with a roll-to-roll process for higher productivity, contributing to lower total costs for the customer. Demand for this product is expected as an alternative to glass in LCDs and other displays.

Early commercialization of dye-sensitized solar cells by achieving a generating efficiency of 10%

Dye-sensitized solar cells are known for the fact that they require less cost and energy to manufacture than silicon solar cells. At Nippon Kayaku we have created a fusion of our dye synthesis technologies and resin development technologies and are working to improve the generating efficiency and durability of dye-sensitized solar cells, aiming to achieve a generating efficiency of 10% within 2–3 years. Going beyond the dyes and resins, we are also studying the possibility of creating large-size cells and modularized cells. Because dye-sensitized solar cells are capable of generating power indoors, we are developing modular applications focused on indoor use and are working for rapid commercialization of this technology.

Developing new functional sheets focused on higher added-value areas, aiming to achieve sales of 5 billion yen in the fiscal year ending May 31, 2016

We are actively expanding our business for new functional sheets based on a reactive polyamide resin developed independently by Nippon Kayaku. First, we are focusing on our FAS heat-resistant insulating adhesive sheet and KTM heat-conductive insulating adhesive sheet, which we are planning to develop into a business with sales of 500–600 million yen by the fiscal year ending May 31, 2013. By the fiscal year ending May 31, 2016, we will add new products and expand the business to the scale of 5 billion yen in sales, making it a new pillar of our business. The FAS heat-resistant insulating adhesive sheet is used primarily in applications where high heat resistance and reliability are required, such as adhesives for motor parts and insulating substrates for automobiles. We have already established a pilot plant at our Fukuyama Plant, and are aiming to market this product during the first half of the fiscal year ending May 31, 2012. KTM is a heat-conductive insulating adhesive sheet that adds a filler with high heat conductivity to FAS, providing thermal conductivity of 5–10 W/(m•K) or higher—a level that is difficult to achieve with existing sheets. Compared with ceramic-type heat radiating material, this product has advantages including being less expensive, lighter weight, and easier to use, as well as a higher degree of freedom in terms of size. Demand is expected in the high-output power semiconductor modules used in products such as electric vehicles (EV), and we are conducting active marketing activities as we work toward the full-scale adoption of these products beginning from 2013, when the EV market is expected to pick up speed.