## CHEMICALS | LIQUID CRYSTALS

Liquid crystal mixtures from Merck are used all over the world – for example, in most LCD (liquid crystal display) televisions, computer monitors, notebooks, digital cameras and mobile phones, as well as in many other high-quality displays. Merck is the global market leader in this field and, thanks to continuous investments in research and production, also the technology leader. We are also working on new lighting and display technologies such as OLEDs. In view of climate change and consistently high energy prices, in addition to our core business with display materials we are also active in growth markets. These include the use of solar energy and the development of innovative technologies for energy-saving LEDs.

## KEY PRODUCT

– licristal® – Liquid crystal mixtures for displays

## OTHER PRODUCT GROUPS

– livilux® – Materials for OLEDs (organic light-emitting diodes) in displays and for innovative lighting

– isishape® – Efficient and environmentally friendly materials for producing solar cells and touch screens

## KEY DEVELOPMENTS IN 2009

– Market and technology leadership maintained

– Total revenues fall short of 2008, but resume steady growth after reaching their lowest point in the first quarter

– Fourth quarter sees year-on-year growth in total revenues of 20% to € 201 million

– Operating result impacted by the effects of the economic crisis and capacity underutilization

– Technological leadership with innovative liquid crystal mixtures for PS-VA (polymer-stabilized vertical alignment) applications

**Smartphone Blackberry® Storm™ 9500 with touch screen**
A high-quality display – for mobile communication too.

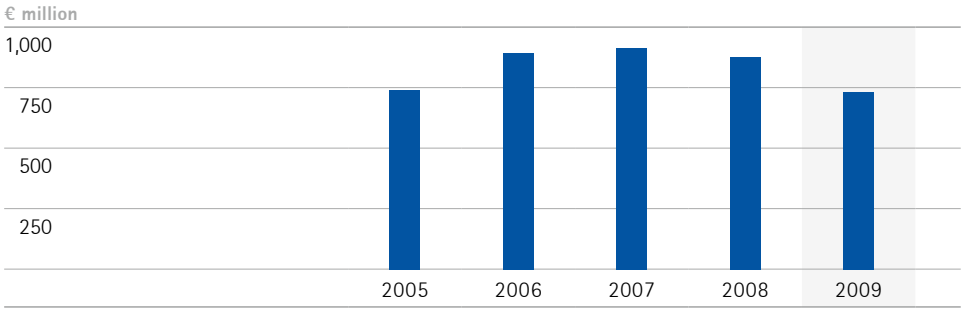
**Ultrathin TV**
Our new PS-VA technology provides better picture quality for rapidly moving images.

# RECOVERY UNDERWAY

The global liquid crystal display (LCD) business is showing signs of an upturn. A recovery is clearly underway in the Liquid Crystals division, which is entering new fields of growth with innovative technologies.

Total revenues of the Liquid Crystals division resumed steady growth after reaching their low point in the first quarter. Despite the 17% decrease to € 733 million in 2009, for the first time in a year they exceeded the € 200 million mark again in the third quarter. This trend continued in the fourth quarter, when total revenues increased by 20% to € 201 million over the year-earlier period. The continuing upward trend is due to the overall recovery of the global liquid crystal display (LCD) business.

**Liquid Crystals | Development of total revenues**




www.merck-chemicals.com/lcd-emerging-technologies

In view of the rapidly increasing population and a growing middle class, market research institutes such as DisplaySearch assume that China will overtake the United States in the coming years as the world's largest market for televisions. Today, China is already one of the key investment markets for display manufacturers in Korea, Japan and Taiwan.
At € 356 million, the gross margin of the Liquid Crystals division was 34% lower in 2009 than in 2008. Because of increased price pressure as well as underutilization of production capacities and the associated costs, the operating result fell by 42% to € 227 million. Return on sales decreased to 31.0% in 2009 compared to 44.6% in 2008. At € 292 million, underlying free cash flow was 28% lower than in 2008.

**Liquid Crystals | Key figures**

| in € million | 2009 | 2008 | Δ in % |
|---|---|---|---|
| Total revenues | 733 | 878 | –17 |
| Gross margin | 356 | 542 | –34 |
| R&D | 87 | 85 | 3.2 |
| Operating result | 227 | 391 | –42 |
| Exceptional items | – | – | – |
| Free cash flow | 292 | 402 | –27 |
| Underlying free cash flow | 292 | 407 | –28 |
| ROS in % | 31.0 | 44.6 | |

**Market conditions recover**

The major display manufacturers recovered well from the crisis of the first quarter. The high degree of underutilization seen at the beginning of 2009 was overcome in the course of the year. The Taiwanese display market presents a particularly positive picture. Manufacturers here are primarily suppliers to the electronics industry and were the first to be affected by the consequences of the economic downturn. However, this market quickly recovered in 2009. The major brand manufacturers in Japan and South Korea, who also manufacture displays themselves and mainly cover the higher-price market segment, also overcame the crisis in the second half of the year. The revival of demand from display manufacturers had a correspondingly positive effect on our quarterly results in the course of the year.
After cutting back liquid crystal production as a result of the global drop in demand, our plant capacity utilization has meanwhile returned to the levels before the economic crisis.

**New display technologies continue to advance**

www.merck-chemicals.com/display-materials

With our innovative liquid crystal mixtures for Polymer-Stabilized Vertical Alignment (PS-VA) applications, we further expanded our technology leadership. PS-VA is increasingly becoming the preferred technology for high-quality displays. It is successively replacing conventional Vertical Alignment (VA) technology, the dominant LCD-TV technology developed by Merck a number of years ago now facing unabated, strong competitive pressure. With VA technology, slits in the electrodes or microscopic three-dimensional protrusions, allow the liquid crystals to align in the correct direction when they are switched. With PS-VA, a polymer layer within the display allows the molecules to be pre-oriented in a certain direction. In the black state, the liquid crystals are not vertical, but slightly tilted: The tilt locally predefines the liquid crystal switching direction. This results in extremely rapid switching times, which are enormously important for displaying lifelike moving images. Besides improved moving picture quality, the technical advantages of PS-VA are faster switching times, higher contrast and better light transmittance. These features reduce the required backlight power, which is both one of the most expensive display components to produce and the biggest power consumer during operation.

PS-VA technology makes previously unattainable screen properties possible.

PS-VA technology opens up new possibilities for LCD producers to achieve previously unattained screen properties. In an LCD television incorporating PS-VA materials from Merck, the colors appear fuller, warmer, and more natural. In addition, the spatial depth of the display is greater, and movements are livelier. In Taiwan, Korea and Japan, this technology is already being used in mass production.
The term LED TVs is used to describe televisions in which only the backlight consists of LEDs (light-emitting diodes), thus achieving better picture contrast and brightness, and producing more lifelike images. Individual areas of the illuminated surface for displaying a deep black can be separately dimmed or switched off completely, thus enhancing the contrast. The advantages of LED and LCD are combined in this way. Further significant advantages include the low energy consumption and slim design of flat screens.

**Higher spending on research and development**

We continue to invest in research and development in order to maintain our leadership position in display materials. At € 87 million, R&D spending was 3.2% higher in 2009 than in 2008. A new chemical research center is currently being constructed at the Darmstadt site. Certain aspects of LC and OLED research will be conducted here. It is scheduled for commissioning in the third quarter of 2010. We expanded our site in South Korea in order to strengthen our research and development activities and further intensify our cooperation with customers. In addition, we are working on reactive mesogens, which are polymerizable liquid crystals that can be used, for example, as material for optical films. They help to enhance the display image quality. Aside from liquid crystal technology, our researchers are working on materials for innovative displays. Here the special focus of development is on OLED materials. They are already being used in mobile phones, MP3 players and digital picture frames.

**OLED research in science and industry networks**

www.merck-chemicals.com/oled

In our efforts to advance OLED technology, we are increasingly participating in research networks. The development of "new materials for OLEDs from solution" (NEMO) is the focus of a project that Merck has launched as the consortium leader together with partners from industry and science. The aim of this collaboration, which is funded by the German Federal Ministry of Education and Research, is to develop innovative, soluble materials for use in large-area OLED components for devices such as flat screens, electronic traffic signs or lighting systems.

OLEDs consume little energy and offer sharp images from nearly every viewing angle.

An OLED is a solid-state device composed of thin films of organic semiconductor molecules that create light when electrical current is applied. The main difference to inorganic light-emitting diodes (LEDs) is their lower current density and laminar light density and the fact that no crystalline materials are required. OLEDs are already being used in small-area displays, for instance in mobile phones and MP3 players. They consume little energy and offer sharp images from nearly every viewing angle. By using ultra-thin luminescent layers, OLED technology makes it possible to produce unique, large-area homogeneous lighting surfaces with a total layer thickness of just a few millimeters. Compared to the vacuum evaporation process used today, these new materials should significantly improve scalability and coating efficiency in particular. To this end, the NEMO project partners are focusing on soluble, phosphorescent materials for red, green and blue applications. In order to develop marketable solutions quickly, different injection, transport and electrode materials as well as adhesives are being researched, evaluated and tested in parallel for their performance. In addition, as the leading producer of high-performance OLED materials Merck is collaborating with Braunschweig Technical University and the U.S.-based company Applied Materials on a project called "Light InLine" to develop processes to reduce the production costs of OLED lighting. Produced on glass plates or flexible substrates, OLED tiles can emit white light that is more homogeneous and more energy-efficient than the light from conventional fluorescent lamps.

### Alternatives to incandescent light bulbs

www.merck-chemicals.com/solid-state-lighting

Incandescent lights bulbs will be phased out in Europe by 2012. Possible alternatives are the subject of intense discussion. For some time now, our researchers have been working on innovative lighting materials – activities grouped together as "Solid State Lighting". These are aimed at developing lighting materials for white LEDs, which constitute an alternative to conventional light bulbs and energy-saving lamps. Our OLED materials can be used not only for this kind of spot lighting, but also for innovative area lighting, making it possible to generate large-area, energy-saving light. Here, prototypes have already been developed in cooperation with leading lighting manufacturers.

### Photovoltaics – a key technology

www.merck-chemicals.com/photovoltaic-materials

Following the strong growth achieved in 2008, the photovoltaics market stagnated in 2009. The cutback in government subsidies was especially noticed by manufacturers in Asia and Europe. Nevertheless, photovoltaics is one of the key technologies of the future with respect to renewable energy sources. Therefore, the division is focusing on developing materials for the production of organic solar cells and for printing technologies. With the isishape® range, we already offer solar cell manufacturers printable etching pastes, which enable them to use the required production material in a more cost-efficient and eco-friendly way.
Within the scope of a development project sponsored by the German Ministry of Research, Merck is collaborating in the field of organic photovoltaics with other leading industrial companies on innovative materials for alternative energy sources. This project aims to increase the efficiency of organic solar cells and to use cost-effective printing processes to produce these highly efficient cells. Our Technical Centre in Chilworth, near Southampton, United Kingdom, which was expanded in 2009, is conducting work in this area.

### Dye-sensitized solar cells

Dye-sensitized solar cells imitate nature with the aid of artificial photosynthesis.

In parallel, we are working on new technologies, for example dye-sensitized solar cells (DSSCs), which are used as a renewable energy source in photovoltaics. They imitate nature with the aid of artificial photosynthesis, an application of nanotechnology for energy generation. The electrolytes in the dye-sensitized solar cells are based on ionic liquids. Merck has a worldwide leading role in the development and manufacture of these.
In order to advance this technology, we started cooperating closely in 2009 with Dyesol of Australia, the leading specialist for materials and components for the production of dye-sensitized solar cells. In the Ionic Liquids business, we have a broad knowledge base and hold numerous patents for new formulations. The cooperation with Dyesol enables us to optimize the development of opportunities worldwide in the attractive market for dye-sensitized solar cells. The use of ionic liquids as a main component of electrolytes creates the possibility to produce both rigid and flexible solar cells. This special feature will enable us to develop many new fields of application in the future.

# CHEMICALS | PERFORMANCE & LIFE SCIENCE CHEMICALS

Specialty chemicals from Merck are important components of the process chain from drug development to industrial production. They ensure reliable analysis in research and dependable production processes. People encounter our products in many technologically complex applications and day-to-day products such as automotive coatings, medicines or cosmetics. Expertise in chemistry and customer-centric innovations have made us a successful supplier to the pharmaceutical, cosmetics, food, plastics, coatings and printing industries. Our goal is to further expand our know-how in regulated markets. The division operates in three business areas: Laboratory Business, Life Science Solutions and Pigments.

## KEY PRODUCT GROUPS

- Laboratory chemicals available in various specifications including the relevant certificates of analysis and safety data sheets, thus ensuring reliable and comparable results.
- Products and solutions using the latest technological expertise in chemical and biotechnological processes, and geared to customer needs in a variety of sectors, particularly the pharmaceutical industry.
- Innovative effect pigments for use in coatings, packaging and product design, which impart not only decorative but also security-relevant features, such as brand and anti-counterfeit protection.

## KEY DEVELOPMENTS IN 2009

- Steep decline in sales of effect pigments impacts the division's performance
- Free cash flow doubled by reduction of inventories
- Life Science Solutions and Laboratory Business largely stable
- Leading role assumed in the Indian biosciences market through the acquisition of Bangalore Genei
- Acquisition of Taizhu, a leading Chinese supplier of effects pigments, offers new growth opportunities

**Singlepath®**
Dangerous coli bacteria can be detected within seconds.

**Ectoin**
This natural active ingredient helps regenerate damaged skin.

**Ronaflair®**
Pearl-luster pigments give lips ultimate gloss.

# GLOBAL ECONOMIC TURMOIL IMPACTS PERFORMANCE

The division clearly felt the drop in demand, particularly in the automotive industry, which is a cyclical business. Sales of effect pigments fell sharply and resulted in underutilization of pigment production capacities in the course of the year.

The development of total revenues and operating result in the Performance & Life Science Chemicals division reflects the effects of the global economic crisis. In 2009, total revenues declined by 3.8% to € 1,202 million. While the Life Science Solutions and Laboratory businesses largely remained stable, the decline in effect pigments particularly impacted business performance. The division was especially affected by the global drop in demand in, for example, the automotive industry, which is a cyclical business. Performance was strongly influenced by, among other things, the underutilization of production capacities in the Pigments business. Gross margin decreased by 12% to € 556 million. The operating result fell to € 97 million, which corresponded to a decrease of 42% compared with 2008. At 8.0%, return on sales was significantly lower than in 2008. By contrast, underlying free cash flow rose significantly as a result of massive reduction of inventories, doubling to € 140 million.

**Performance & Life Science Chemicals | Key figures**

| € million | 2009 | 2008 | Δ in % |
|---|---|---|---|
| Total revenues | 1,202 | 1,249 | –3.8 |
| Gross margin | 556 | 633 | –12 |
| R&D | 54 | 58 | –7.8 |
| Operating result | 97 | 167 | –42 |
| Exceptional items | 12 | –46 | – |
| Free cash flow | 119 | 58 | 106 |
| Underlying free cash flow | 140 | 67 | 109 |
| ROS in % | 8.0 | 13.3 | |

www.merck-chemicals.com

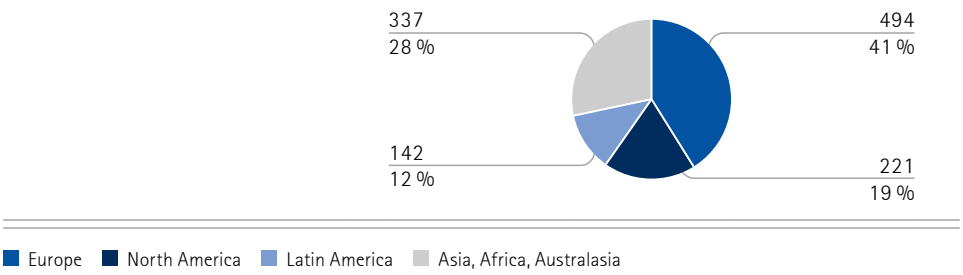
The division bolstered its business by resolutely managing costs and optimizing cash flow. Cutting pigment production in response to the downturn in demand proved to be an effective measure. Consequently, reduced working hours or similar measures were introduced at all pigment production sites. By consolidating our sites in the United States, a process which began in January 2009, we laid the foundation for the long-term profitable growth of our U.S. subsidiary EMD Chemicals. In parallel, we significantly increased the range of innovations we offer customers, optimized our delivery and supply chain, and expanded our web presence. We now have 50 country-specific websites in 20 different languages. The division also continued to invest above average in research and development, although more moderately than in 2008. R&D spending amounted to € 54 million in 2009, which corresponds to a decrease of 7.8%. A main focus of spending was on centers of application technology that support the sales departments. In addition, we have sustainably strengthened our businesses through acquisitions and cooperation agreements.

### Differentiated growth in Asia

The division performed well in important markets of Asia. In India and Japan, sales increased to € 54 million and € 76 million, respectively, corresponding to year-on-year growth of 14% and 3.4%, respectively. Business was negatively impacted in otherwise strong markets such as Taiwan and China, which were particularly affected by the global economic crisis in the first half of 2009. Sales in Taiwan decreased by 3.8% to € 25 million and in China by 2.9% to € 34 million compared with 2008. In Latin America, our business remained stable. Our traditionally high market shares in this region helped us to solidly secure ourselves against further economic downturns.

**Performance & Life Science Chemicals | Sales by region**

€ million




The Pigments business clearly felt the effects of the global economic crisis.

The Pigments business, which at € 238 million accounted for around one-fifth of the division's total revenues, clearly felt the effects of the global economic crisis in 2009. The demand for automotive coatings fell substantially as a result of declining production in the automotive industry. By contrast, the Laboratory Business grew slightly and, at € 524 million, accounted for almost half the division's total revenues. Life Science Solutions, which is less dependent on economic cycles, also showed stable performance. At € 440 million, this business accounted for about one-third of the division's total revenues.

## LABORATORY BUSINESS

### Growth in Asia and Latin America

www.merck-chemicals.com/food-analytics

Despite the global economic crisis, total revenues of the Laboratory Business rose slightly by 0.6% in 2009. We achieved satisfactory growth of 5.5% in Asia, Africa and Australasia. Sales in this region amounted to € 164 million. Sales in Latin America slightly exceeded the 2008 level, totaling € 79 million. By contrast, sales in the European market declined by 3.7%, not least as a result of negative currency effects in eastern Europe. Sales in Europe amounted to € 186 million. In the North American market, sales increased by 2.1% to € 95 million.

### Innovations in the microbiology business

The microbiology business was hardly affected by the global economic crisis and continued to perform very well, especially thanks to innovative solutions for microbiological tests designed for customers in the food, diagnostic and pharmaceutical industries. These include the foodproof® test kits for detecting bacterial DNA using state-of-the-art techniques, as well as antibody-based lateral flow tests from the Singlepath® and Duopath® product line.

### Deliveries of acetonitrile maintained despite the crisis

The shortage of acetonitrile was the greatest obstacle faced by the global Laboratory business.

In 2009, the greatest obstacle faced by the global Laboratory business was the serious shortage of acetonitrile on the global market. This raw material, also used as a solvent in high-performance liquid chromatography (HPLC), is a by-product of acrylonitrile production. The demand for this substance dropped drastically as a result of the economic downturn, which led to the standstill of many acrylonitrile production plants. We were able to maintain deliveries of acetonitrile to our customers despite the shortage.

### Stronger presence in the Indian market

In October, we acquired Bangalore Genei, an Indian company specializing in the development, production and sale of products for proteomic and genomic research. Combining the activities of Bangalore Genei with our existing biosciences business has made us the leading supplier of bioscience products in the growth market of India.

## LIFE SCIENCE SOLUTIONS

### Stable in a difficult market environment

Growth in the Crop BioScience business.

Against a backdrop of difficult economic conditions, total revenues of Life Science Solutions decreased in 2009 by 1.2% to € 440 million. In the important market of North America, sales declined by 4.2% to € 81 million and in Latin America by 1.1% to € 48 million. The proceeds from the divestment of our business with natural substances in Brazil amounted to € 11 million. Furthermore, we optimized our business with measures to improve cash flow and systematically reduce inventories. We achieved very strong growth with natural crop enhancement technologies developed by our Crop BioScience business, particularly in North and Latin America.

### New products for biopharmaceuticals

In 2009, we further intensified our research and development of materials for biopharmaceutical production. In the pharmaceutical sector, the share of the market accounted for by new biological entities has grown significantly compared to that of new chemical entities. We are taking this development into account by supplying the materials and services needed for biotech production along the value chain.

### Innovative cosmetic active ingredients

www.merck-chemicals.com/cosmetic-ingredients

In 2009, our cosmetic active ingredients business with some of our key global customers declined. However, we set new accents in the market with further developments of, for example, the self-tanning agent DHA Plus® and the successful brand Ronaflair®, functional fillers that feature special optical and sensory properties.

## PIGMENTS

### Slight recovery in demand at year-end

www.merck-chemicals.com/pigments

In 2009, the Pigments business was marked by weak global demand particularly in the automotive industry. With effect pigments for automotive coatings, Merck is an important supplier to the industry. Total revenues of effect pigments for the cosmetics industry also declined substantially. However, signs of recovery in the Pigments business and a return to higher production levels began to emerge in the third quarter – a development that continued in the fourth quarter. Owing to the decline in demand, Merck introduced reduced working hours in May for around 300 employees at the pigment production site in Gernsheim and transferred them internally to other production areas. We also significantly cut back pigment production at the plants in Savannah, Georgia in the United States, Onahama in Japan and Songjiang in China. As the order situation improved, we considerably scaled back the use of reduced working hours in the course of the year and completely discontinued it at year-end. Although total revenues declined overall by 10% to € 238 million and sales, particularly in Europe, fell by 20% to € 92 million in 2009, an increasing recovery in demand was noticeable as of the third quarter.

Weak demand for consumer goods and continuing consumer uncertainty also affected the business with pigments for plastics, print products and cosmetic products. Against this background, we continue to focus our innovation efforts on profitable pigments such as Candurin® pigments for coating foods and pharmaceuticals, and on the Pyrisma™ line of products, which covers a wide color range and offers intense effects.

### Acquisition of one of the leading suppliers of effect pigments in China

Position in the fast-growing Chinese market further expanded.

We captured new growth opportunities by acquiring Suzhou Taizhu Technology Development, a leading supplier of effect pigments in China, with a growing, profitable business. As a result, we have further expanded our position in the fast-growing Chinese market. The extended range of products now enables us to more actively target the mid-range value-for-money price segment. This is a fast-growing segment between the premium-price segment, which we had already been addressing, and the low-price segment of the respective countries.

### New cosmetic applications

In 2009, Merck significantly expanded its portfolio in both cosmetic functional fillers and in the core business of pearl luster pigments. We entered into a licensing agreement with the Australian company Antaria for the exclusive worldwide rights to the plate-like alumina technology. The technology is used by Antaria in Alusion®, a functional filler that gives cosmetics soft focus properties, among others.

### Expansion of the functional pigments business

New impetus from acquiring the laser pigments business of DSM.

In order to expand our activities, we acquired the Micabs® laser pigments business from the Dutch chemical company DSM. This move gives us access to new technologies for the manufacture of laser marking products and complements our Lazerflair® pigments with the Micabs® brand.