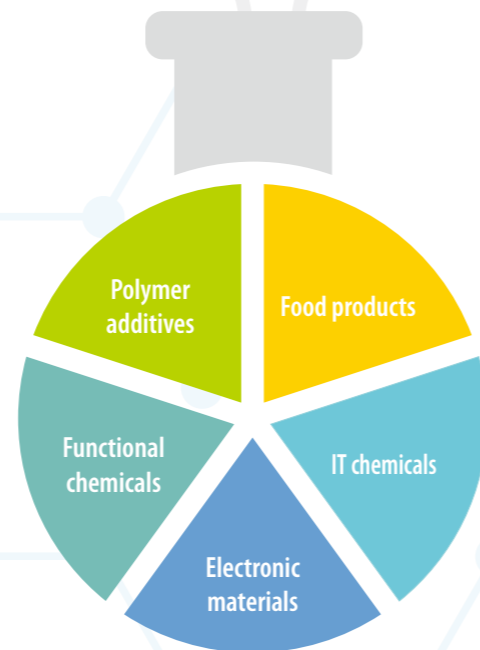


Special Feature Research & Development in the ADEKA Group

Contributing to the Sustainable Development of Society

Since the founding of the company, the ADEKA Group has developed proprietary fundamental technologies that can be utilized and applied to a diverse range of applications in the chemicals and food business divisions. In a society that has become increasingly demanding toward the aspects of convenience, comfort, safety, and security, we will take up the challenge of creating valuable products that are integrated with our proprietary technologies, and put our best efforts into solving social issues.



Fuel-Saving Effect Generated by 0.1%

Polymer Additives

Plastics are used in various applications such as automobiles, home appliances, electronic device parts, construction materials, and packaging materials. Polymer additives play an indispensable part in improving the performance and functionality of these plastics.

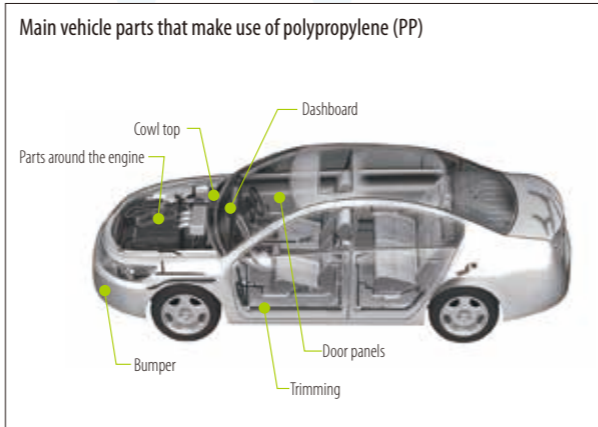
Of these, the nucleating agent used to improve the strength and heat resistant property of the most commonly used resin, polypropylene (PP), is vital to the automotive and home appliance sectors. Furthermore, as it dramatically reduces the time needed for the formation of plastic, it also brings about the advantages of energy conservation and cost reduction. As such, there is constant demand for the expansion of resin applications, as well as for improvements in performance.

ADK STAB NA-27 is a high-performance nucleating agent developed through the concentration of our polymer additive technologies. The addition of this agent to car bumpers, rear passenger doors, and other parts that contain PP helps to increase the rigidity of these component parts while improving their durability. Compared to PP containing no additives, PP with just 0.1% of NA-27 can reduce the thickness

that can withstand certain weights by 7%. If this is applied to the context of a car, which is said to use approximately 90kg of PP, it would translate to weight reduction of approximately 6kg. As the weight of the vehicle body has direct impact on fuel efficiency, the use of this additive can generate significant impact in terms of improving fuel efficiency.

With the increasingly widespread acceptance of electric vehicles (EV) that are fitted with batteries, developing technologies and products that can provide support for reducing vehicle weight will become increasingly important in the near future. Greater expectations are placed on our high-performance nucleating agent year after year.

As an additive manufacturer, we will continue to undertake research and development activities in an earnest and steadfast manner, and to develop new products for people, so that the plastics industry can contribute to improving society.



Efficacy when 0.1% of ADK STAB NA-27 is added to 90kg of PP

Weight reduction of approximately **6** kg



Shinichi Ishikawa
General Manager, Additives Solution Dept, Polymer Additives R&D Laboratory

R&D Laboratories that Provides Support for ADEKA's Technologies

ADEKA continues to tackle the challenge of developing new technologies every day.

Ogu R&D Laboratory



Urawa R&D Laboratory



Kuki R&D Laboratory



Making Food Taste Delicious Through Our Oils and Fats Products

Food Products

ADEKA Group's processed oils and fats products, including margarine, shortening, whipped cream, and mayonnaise, are used in various foods such as bread, confectionery, and frozen food products. These oils and fats products play an important role in making food taste delicious by improving their flavors and texture.

For example, the "Aromade Series" of margarine used in bread and confectionery was created through research conducted on the ingredients in butter that produce its savory taste. This series of margarine products stands up to butter in terms of taste. In addition, the "Olympia Juicy Sheet Series" of margarine, used for kneading into croissants and Danish dough, was developed based on research conducted on how butterfat solidifies (crystallization property of oils and fats). This margarine is able to produce croissants with a juicy texture that is in no way inferior to the texture produced using butter. Both of these products have been highly appraised by our customers.

Our "Pure Blend Whip Series" of whipped cream, used in non-baked cakes and desserts, is a whipped cream with a fresh milky flavor, created through research conducted on the emulsification structure of fresh cream.



Amongst our mayonnaise products, the "Renge-de-OK Series," which provides greater safety for use directly from the freezer to the microwave, is used in a wide variety of frozen food products.

ADEKA's technologies for creating good tastes are applied to a wide variety of food products, and contribute to a richer dietary life.



Kenji Ikeda
General Manager, Food Research Dept, Food Development Laboratory

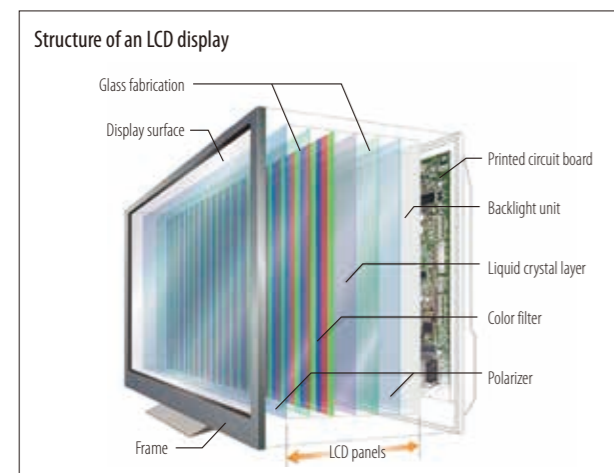
New Materials with High Added Value Provide Support for Comfortable Living

Information Media Materials

Photo initiators are key materials that provide support for improving definition and brightness on LCD display screens used in LCD television sets, smartphones, and computers. They are also used in the production of color filters that bring out the beautiful and vivid colors of videos and photographs.

While IT and electronic equipment are becoming increasingly thin and lightweight, the trend in LCD screens is heading toward higher image quality and larger screens. Consequently, users are seeking lower power consumption and better color reproductivity for the color filters used in LCD displays.

By harnessing the technological capabilities for precision organic synthesis that we have developed in our Information Media Materials Laboratory, we have



succeeded in developing photo initiators that show strong chemical reactions to light. Compared to conventional photo initiators, our products are highly sensitive to light, and contribute to improving the definition of color filters.

Color filters that make use of our photo initiators also have excellent transparency. As such, they make it possible for LCD displays to produce a high level of brightness and clarity, and enable the reproduction of beautiful colored images with just a small amount of light. In this way, they also contribute to energy conservation.

Going forward, we aim to further enhance our technological capability, build a stable supply system, and contribute to realizing a rich and comfortable society on a global scale.



Koichi Shigeno
General Manager, Photochemical Materials Dept,
Information Media Materials Development Laboratory

Developing Wind Power Generation Products with the Aim of Contributing to the Realization of a Recycling-Oriented Society

Functional Chemicals

In recent years, countries around the world have been increasingly adopting the use of wind power generation as part of their measures to counter global warming. Wind power generation harnesses wind, a form of renewable energy, and is said to be highly effective in reducing the generation of greenhouse gases. On the other hand, as wind power generators must be placed in locations that have a good flow of wind, such as on mountain peaks or on the sea, one important issue to consider is how to prevent lightning and other factors from causing damage to the blades (wings).

We have developed epoxy resin that contributes to strengthening blades and improving power generation efficiency, by combining the resin composition and curing technologies that we have accumulated over the course of the company's history. In tandem with the growing scale of

wind power generators, there are also rising concerns about the increasing weight of blades. However, our epoxy resin product is able to reduce the weight of these blades as it is more than 20% stronger than previous products, thereby reducing the weight on components parts. In this way, it is expected to contribute to increasing power generation capacity.

As the resin hardens even at low temperatures conditions of about 5°C, it is possible to quickly repair wind power generator blades that have been damaged by lightning, thereby preventing losses in operation time. In this way, the resin is expected to improve power generating efficiency.

In order to contribute to the realization of a resource recycling-oriented society in the future, we aim to focus the research and development capabilities that we have built up to date on the renewable energy sector.



Nobuyuki Shimamura
General Manager, Functional Polymer Materials Dept,
Functional Chemicals Development Laboratory



Heat-Dissipating Insulation Sheets that Contribute to the Environment and Energy Sectors

Electronic Materials

The question of how to utilize limited energy resources is a current and global issue, and the development of technologies that can support energy conservation and an energy-conserving society has become crucial to our society.

In recent years, LED lighting that lasts longer while consuming less electricity as compared to incandescent light bulbs that produce the same degree of brightness, as well as SiC (silicon carbide) power semiconductors that are expected to produce a high level of power conversion efficiency when used in areas such as EV, trains, and power generation, have been drawing more and more attention as trump cards that could potentially be used to realize an energy-conserving society.

Heat-dissipating insulation sheets are indispensable for LED lighting and SiC power semiconductors. They serve the role of dissipating the heat generated from

LED chips and semiconductor chips, protecting the electronic parts.

The heat-dissipating insulation sheets developed by ADEKA have high heat dissipation properties, with thermal conductivity above 10W/mk. In addition, through our proprietary resin development, the sheets boast the highest level of heat resistance (above 300°C) in the industry. We are currently reviewing the possibility of application in a wide range of fields, including domestic circuit board, parts, and final product manufacturers.

Going forward, we aim to develop and supply materials with high added value that can contribute to society in the environment and energy sectors.



Heat-dissipating insulation sheets

Takahiro Mori
General Manager, Packaging Materials Dept,
Electronic Materials Development Laboratory

R&D Laboratories and Research Subjects

R&D Laboratories	Research Subjects	Ogu	Urawa	Kuki	Kansai
Polymer Additives R&D Laboratory	Antioxidants, Light stabilizers, Stabilizers, Plasticizers, Nucleating agents, Clarifiers, Flame retardants, UV absorbers		●		
Information Media Materials Development Laboratory	Photoreactive materials, Recording materials, Imaging materials	●			
Electronic Materials Development Laboratory	Semiconductor materials, Etching materials, Resin film materials	●		●	
Environmental and Energy Materials Laboratory	Light wavelength converter, Pigment sensitizer, Infrared reflective films, Lithium-ion battery additives, Soil purifiers	●			
Functional Chemicals Development Laboratory	Epoxy resins, Curing agents, Urethane resins, water-swelling sealing materials, Surfactants, Lubricating additives	●		●	
Food Development Laboratory	Commercial margarine for folding and blending, Filling creams, Whipped creams, Functional mayonnaise, Frozen pastry	●			●
Life Science Materials Laboratory	Beta-glucan, Mevalonolactone, Nano-beacon	●			

Heat-dissipating insulation sheets developed by ADEKA

Thermal conductivity of **10** W/m·k
Heat resistance above **300** °C