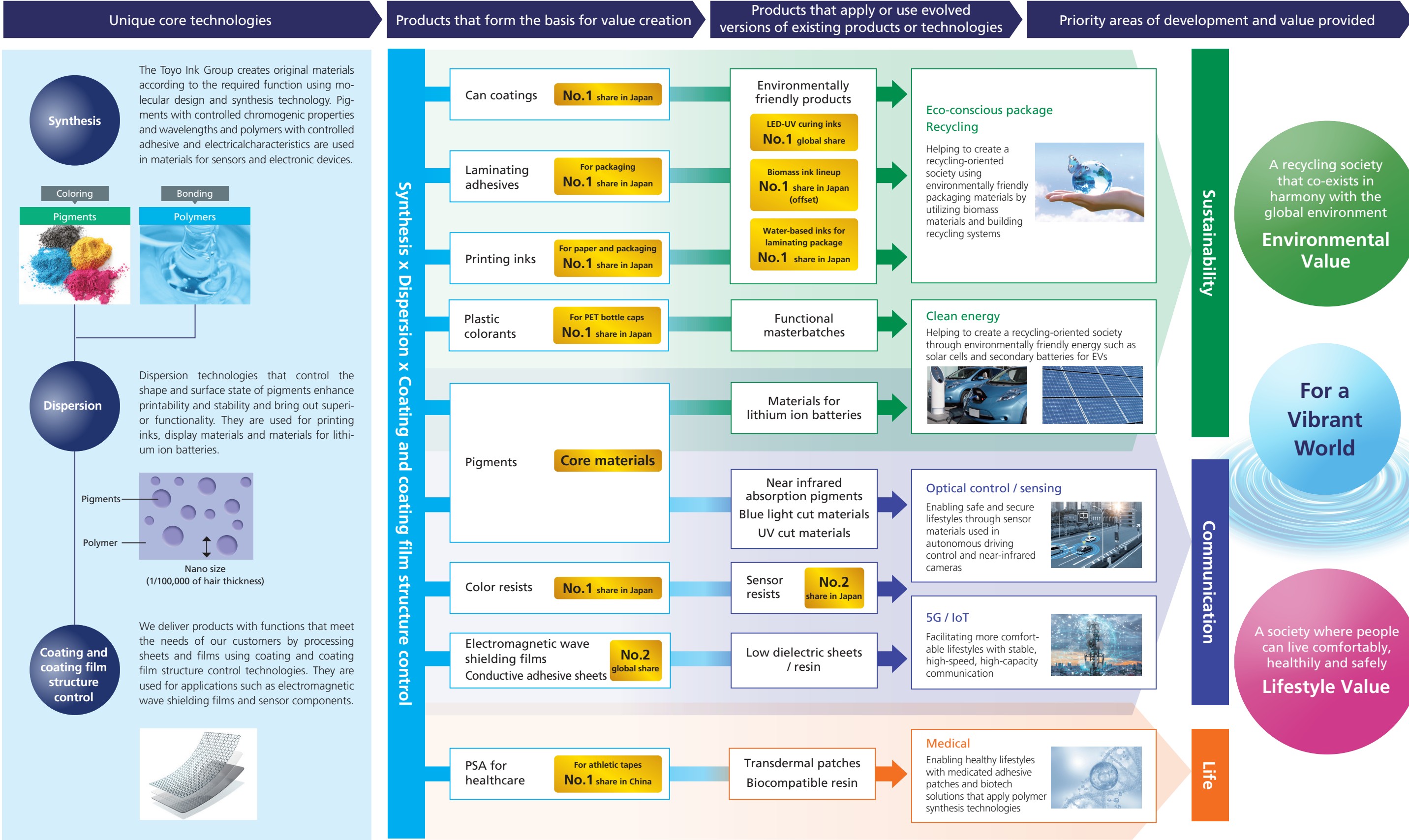


Strengths that Form the Basis for Value Creation — Unique Core Technologies and Growth Potential

The Group has invested considerable business resources into fields where it can leverage its technological strengths—such as technologies for the synthesis of pigments and resins, and processing technologies such as dispersion, coating and coating film structure control. Going forward, we will work to create healthier and more comfortable lives for people around the world by focusing on the creation of new businesses in three key development areas—sustainability, communication, and life.



Strengths that Form the Basis for Value Creation — Initiatives in growth markets

With the global trend toward decarbonization, the shift to EVs is progressing rapidly. In particular, manufacturers are constructing production plants and trying to improve production capacity for automotive batteries in anticipation of future growth in demand, primarily in Europe, the United States, and China. Various projects are also being implemented to encourage the spread of EVs, with the involvement of governments of various countries. Partly as a result of these developments, the global market for lithium-ion batteries (LiBs) is expected to increase in size by around 5–10 times over the course of the next ten years, to 2030, and continue to further expand.

Carbon nanotube (CNT) dispersions for automotive LiB cathode materials—supplied by Toyocolor Co., Ltd.—utilize our unique dispersion technologies to achieve high battery capacity, contributing to weight reductions and extended cruising ranges for EV batteries. The Group has established a production and supply network in major global production regions for LiBs, enabling delivery of products in a timely manner. Going forward, we will continue to support the supply of CNT dispersions as a leading company in the automotive LiB market—which we expect will continue to expand further in the future—through the supply of materials, thereby contributing to the creation of a decarbonized society.

Dispersions for LiB: An introduction to dispersion technologies

Toyocolor Co., Ltd. has traditionally had strengths in carbon dispersion, and has since acquired various carbon nanotube (CNT) synthesis technologies, developed technologies for stably dispersing CNTs with difficult-to-disperse physical properties, and applied them to various products. Since 2015, the company has been developing and supplying carbon dispersions for cathode materials for lithium-ion batteries (LiBs,) and has gained trust and accumulated results as a manufacturer of LiB materials.

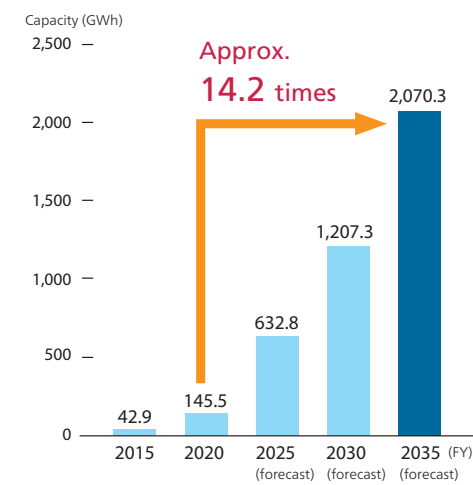
LiB cathode materials are composed mainly of an active material, a conductive material, and a binder. By using CNTs instead of carbon black as the conductive material, it is theoretically possible to achieve conductive performance with only a small amount of conductive material. However, this requires nano-level particle control, in which the fibers of the CNTs are loosened one by one—while maintaining their length—and uniformly adsorbed on the surface of the active material. In addition, since CNT fibers have the property of reducing the fluidity of liquids, there has been an issue in

that highly concentrated dispersions with high fluidity must be designed.

Toyocolor has succeeded in greatly reducing the resistance value of the LiB cathode with a small amount of conductive material by dramatically improving the dispersibility and conductivity of CNTs using a unique dispersant and dispersion manufacturing method, and improving the level of adhesion and distribution to the surface of the active material. In addition, they have achieved high concentration of CNT dispersions with reduced viscosity in comparison with existing products.

By combining these technologies, battery manufacturers—who are our customers—have been able to reduce costs associated with adding conductive materials to LiBs and increase the amount of active material in their cathodes, thereby achieving higher capacity and more compact batteries. High-capacity automotive LiBs utilizing Toyocolor's CNT dispersions offer extended EV operating ranges and improved fast-charging performance.

Automotive LiB battery market trends and forecasts (capacity basis)



Source: Ministry of Economy, Trade and Industry (METI)
"Current Situation and Issues in the Storage Battery Industry" (November 2021)

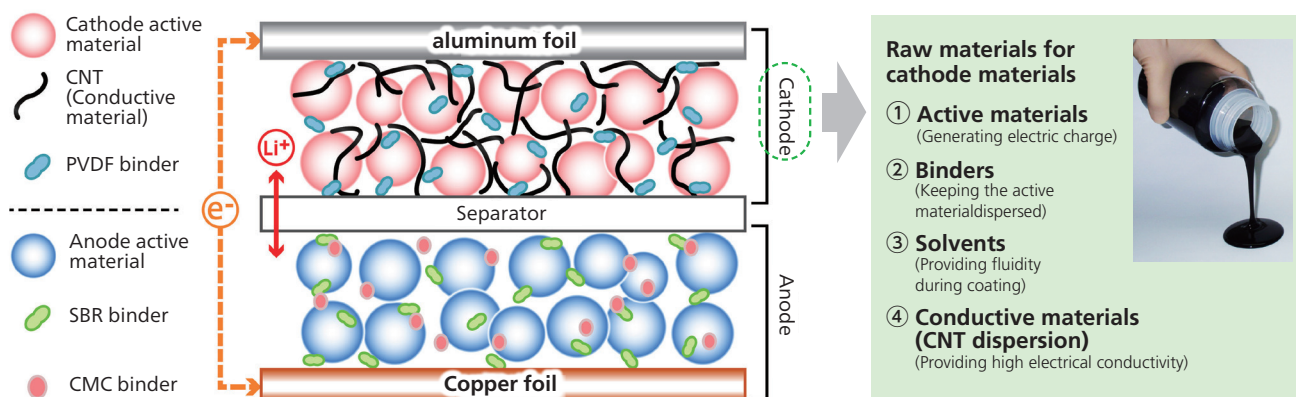
Establishment of mass production and supply networks in four global regions

Toyocolor Co., Ltd. is the first in the industry to establish five mass production bases in four key global regions (Europe, the United States, China, and Japan,) and has built a supply network for global LiB manufacturers. At the same time, it has also obtained various patents relating to CNT dispersions globally.

At the same time as improving conductive materials for next-generation LiBs and exploring new materials, we are also developing dispersants that are optimal for materials, and we will continue to develop products that match market needs.



Structure of LiB electrode



Sales results and targets for the LiB materials business (SIC27 period)

