SANYO PRODUCT TOPICS

Supporting the Performance of Lightweight and Strong Carbon Fiber

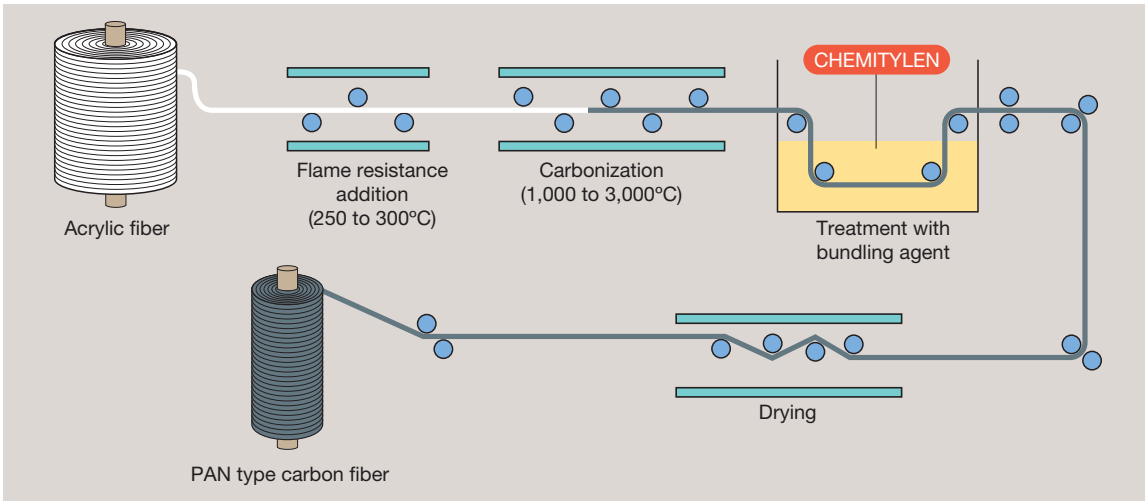
Carbon fiber is a material that is said to be “stronger than iron and lighter than aluminum.”
It presently has wide applications in several fields including automobiles and aircrafts; with applications also expanding into the energy field, contributing greatly to the SDGs.
This article introduces the bundling agent, which is essential for the manufacture of this carbon fiber.

Carbon fibers that keep expanding into aerospace and energy fields

You may have heard about the phrase fiber-reinforced plastic (FRP). This is a plastic material that is made stronger by combining with fibers, one of which is carbon fiber.
Carbon fiber-reinforced plastic (CFRP) is formed by impregnating carbon fibers with epoxy resin and curing it under heat.
Carbon fibers are characterized by strength and light weight; the strength per unit weight is approximately 10 times that of iron. It also increases the resistance to deformation to approximately 7 times that of un-reinforced plastic. Additionally, it has various advantages including resistance to swelling and rusting, high durability against chemicals and heat, and excellent X-ray permeability.
Carbon fiber is approximately twice as strong as glass fiber and approximately 5 times more resistant to deformation, yet some FRPs use glass fiber (GFRP).
These characteristics have led to the development of carbon fiber applications in different fields where strength and lightness are required. In Japan, its utilization began in the field of sports in the manufacture of fishing rods, golf club shafts, and other sports equipment in the 1970s. Industrial applications in industrial machinery, civil engineering building materials, etc. began in full scale during the 90s. Since the 2000s, the use of carbon fiber as an alternative to metals in aerospace and energy, including aircrafts, satellites, and wind turbines has expanded rapidly.

Achieving high performance with the proprietary interface control technology of Sanyo Chemical Industries

Carbon fibers are classified into PAN system, which is obtained by burning polyacrylonitrile (PAN) fibers to convert them into carbon fibers; and pitch system, in which fibers are formed from coal tar and other raw materials that are close to carbon; PAN systems are currently more popular.
Carbon fiber itself consists of thin fibers of a few microns each, as the name fiber indicates. While measures are certainly taken to improve the strength when the fibers are spun or burned to carbonize, it is also necessary to form a thicker thread called “tow,” which comprises of several thousand to several tens of thousands of the fibers bundled together as a single strand of fiber can snap easily. It is the carbon fiber bundling agent that is used for this process and that connects the individual carbon fibers. A carbon fiber bundling agent needs properties to enable it to firmly bundle the “tow” first and to inhibit the fluff caused by broken threads. It also needs to have the flexibility that is necessary for processing. “CHEMITYLEN” by Sanyo Chemical Industries delivers these contradictory features and also excels in its ability to improve the carbon fiber handling properties.



It is also designed to draw out the strength and deformation resistance of carbon fibers as it blends well with the resin during impregnation as CFRP after being processed into "tow." This is achieved by Sanyo Chemical Industries' unique interface control technology that has been strengthened over many years, and is highly evaluated for its performance and used for many carbon fiber products around the world.

Flying car (conceptual drawing)

Utilization in not only the wind turbines in wind power generation, but also in future technologies such as flying cars

Globally, the use of carbon fiber is growing at the rate of 5% to 10% per year, and the demand is expected to continue to grow in the future. In addition to expansion in the existing industry, demands are steadily growing in other areas including hydrogen tanks for fuel cell vehicles, in which only carbon fiber can be effective.
In particular, adoption of carbon fibers enabled the manufacture of 100 meter-class blades for wind turbines used in wind power generation, resulting in a dramatic improvement in power generation efficiency. Previously, it had been possible to manufacture wind turbines of only up to approximately 50 meters in size with glass fibers because of issues such as weight and deflection. Wind power generation is expected to grow by approximately 8% per year in the next decade on the global scale, and it is also showing signs of expansion in Japan following the proposed plans for offshore wind power generation. There is no doubt that carbon fiber will continue to play a major role in the future. It is expected to be used in future technologies such as flying cars, since it is already widely used in aircrafts and drones.
In addition to reduction in energy consumption through weight reduction, carbon fiber, which is expected to grow in demand even with the use of renewable energy, is an important material not only in the utilization of energy and the development of industries, but also as a measure against climate change. It can also be considered to contribute greatly to the SDGs.

Contributing to the SDGs in the future through improvements in mass productivity and adaptability for recycling

Although carbon fibers are increasingly being used in many fields, it does not mean that there are no challenges at present. As hybrid vehicles, electric vehicles, etc. become popularized, expansion in the use of strong and light carbon fibers is expected in the automotive market. However, a bundling agent that can handle the speedup in CFRP manufacturing processes will be necessary in order to support the manufacture of automobile parts produced in markedly larger quantities. Additionally, CFRP that is currently difficult to reuse must be turned into an easily recycled material to realize a sustainable society if full scale use begins in the automotive market.
To improve productivity and adaptability for recycling, the resin used and the molding process may also change. Sanyo Chemical Industries has positioned this change as an important role for a manufacturer and has been working on the development of a carbon fiber bundling agent that matches the resin and process, even though this is a challenging issue. We will continue to further contribute to the SDGs in the future by focusing on the development of "CHEMITYLEN" that will allow production of CFRP, which is expected to evolve further in the future, in a more useful manner and larger volumes.