

Lightweight, Strong, and Flexible Glass Fiber



Chopped strands of ARG Fiber
Photo: Courtesy of Nippon Electric Glass Co.,Ltd.

Ultra-fine glass fiber produced by a manufacturer in Shiga Prefecture has expanded the possibilities of architectural design and is being used in buildings around the world.

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A terminal building of Chhatrapati Shivaji Maharaj International Airport in Mumbai, India, where ARG Fiber was used in the ceilings and pillars
Photo: Courtesy of Nippon Electric Glass Co.,Ltd.

GLASS fiber is a material made by forming melted glass into fibers. One of the main applications is reinforcement materials for construction and automobile parts that require strength and lightness.

Sugiyama Motoyoshi, Department Manager of the Development Department, Glass Fiber Division, Production, Glass Fiber Group at Nippon Electric Glass Co., Ltd., says, “Perhaps it’s because people have such a strong perception of glass being hard, but they find it difficult to believe that glass fiber is actually made from glass, even when they hold it in their hands.”

“The thickness of glass fiber ranges from a few microns (1/1000 mm) to several tens of microns. It is ultra-fine thread that is thinner than hair,” says Sugiyama. “When glass becomes this kind of ultra-fine thread, each thread is flexible, and its strength increases when many threads are bundled.”

Headquartered in Otsu City, Shiga Prefecture, Nippon Electric Glass is a manufacturer of specialty glass established in



The Ginza Kabuki-za Theatre in Tokyo, where ARG Fiber was used in the *karahafu* gables (bottom center) and balustrades
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1944 that has been producing glass fibers since 1976. One of its main products is ARG Fiber (alkali resistant glass fiber), which is used to reinforce cement products. ARG fiber is made by adding zirconiaⁱ, a type of ceramic, in the glass component to achieve both alkali and acid resistance.

Sugiyama explains, “Since cement is alkaline, ordinary glass fibers used to reinforce plastics deteriorate in that environment, but if you mix it with ARG fiber that has excellent alkali resistance, you can obtain sufficient strength even without rebar (steel reinforcing bar).”

ARG fiber is very lightweight compared to rebar. Therefore, GRC (glass fiber reinforced concrete) using ARG fiber weighs about one-third of rebar concrete of the same strength. Moreover, since the ARG fiber is uniformly distributed throughout the concrete members, not only does the strength of the parts as a whole increase, but it is also possible to easily process it into various shapes. For this reason, GRC enables the construction of buildings with complex shapes that would make using rebar difficult. It expands the possibilities of architectural

Tunnel walls covered with mesh ARG Fiber
 Photo: Courtesy of Nippon Electric Glass Co.,Ltd.



design while still providing sufficient strength.

One building that uses these advantages is a terminal building at Chhatrapati Shivaji Maharaj International Airport in Mumbai, India. ARG fiber is used in various places, including pillars with magnificent and intricate decorations suggestive of India’s national bird, the peacock (see photo). The Kabuki-za Theatre in Ginza, Tokyo, which was rebuilt in 2013, also makes use of this technology. By using ARG fiber for decorative mortarⁱⁱ parts such as *karahafu* gablesⁱⁱⁱ and balustrades, traditional designs like wood frame structures are faithfully reproduced in detail, all the while achieving lightness, durability and non-flammability.

Sugiyama comments, “In recent years, many tunnels built in Japan during the period of high economic growth in the 1960s-1970s are becoming old, with concrete pieces falling and rebar corrosion becoming an issue. When performing



Example of an exterior wall decoration made using ARG Fiber
 Photo: Courtesy of Nippon Electric Glass Co.,Ltd.

repair work, mesh ARG fiber can be applied to the bends of the tunnel walls and ceiling. Because it’s mesh-shaped, you can observe the surface of the walls and ceilings through the gaps, so it doesn’t interfere with visual inspections.”

Currently, the applications of glass fiber are expanding into various other fields. Products with new uses are being created one after another, such as the blades of wind turbine generators and materials for electric poles and walls that can withstand storms.

The value of glass fiber just keeps growing, as a material indispensable for the realization of a future sustainable society. **■**

i Zirconia means zirconium dioxide, also known as synthetic diamond. It has excellent strength and durability and is also used in dental treatment.
 ii Made by adding sand and water to cement, it is flexible and fireproof, and is used for walls and floors in houses.
 iii The triangular sections at both ends of the roof are called “*hafu*,” and the curved, mountain-shaped gables found in Japanese architecture such as castles, temples, and shrines are called “*karahafu*.”