PV/C

## **Response to robust** global demand for housing and infrastructure

## A material that helps resolve societal issues

PVC is widely used in categories that are essential to our lives, including water supply and sewerage systems and other infrastructure (social infrastructure); housing; agriculture; and everyday products. Sheets and film made from PVC are being used throughout society as a method of preventing the spread of COVID-19; these include medical gloves, face guards and partitions that help thwart transmission of the virus through saliva droplets. The production of PVC requires little reliance on petroleum resources, and PVC contributes to the efficient use of resources and decarbonization primarily through its facilitation of quickly implementable recycling initiatives.

Annual usage of PVC around the world has increased at an annual rate of about 3% over the past 10 years, exceeding 45 million tons in 2018. Shintech, Inc., a Shin-Etsu Group company located in the U.S., is continuously augmenting its production capacity in response to robust demand stemming primarily from North America and emerging nations.

Approximately

End of 2023

(FY)

#### **Resolving Societal Issues with Our Products**

## PVC and Reduction of CO<sub>2</sub> Emissions

In response to the urgent global issue of climate change, we must curb CO<sub>2</sub> emissions generated throughout the life cycles of our products, spanning from material production to disposal. PVC can be accurately described as a material that contributes to the reduction of CO<sub>2</sub> emissions in the following ways:

#### 1 Curtailment of greenhouse gas emissions generated during the manufacturing process

- Chloride accounts for about 60% of the raw materials used in PVC, which, compared to other plastics, can be produced with low reliance on petroleum resources, thereby limiting the CO2 emissions generated during the manufacturing process.
- PVC products require less energy to manufacture compared to products made from alternative materials (e.g., iron, glass) that serve the same purposes (iron pipes, glass greenhouses, etc.).

#### 2 Contribution to global warming prevention

Long product life having service lives more than 50 years). Thermal insulation curtailment of CO<sub>2</sub> emissions

### 3 Curtailment of greenhouse gas emissions emitted during disposal and recycling processes –

 PVC can be recycled at a rate of about 33%, which is higher than the rates associated with other plastics. Reference: Vinyl Environmental Council (VEC) website

## **Production Capacity Augmentation**

Since it launched operations in 1974, Shintech has risen in prominence through its high-performance production system and its ongoing expansion of production facilities. Currently, it responds to global PVC demand as the world's largest PVC manufacturer. After Shintech implements planned efforts aimed at expanding its production capacity in mid-2021, it will continue to expand its production facilities and targets annual production of 3.62 million tons in 2023 (up about 20% compared with 2020).



#### **Operations Launched at** Shintech's Ethylene Plant Strengthening our stable production system

In 2020, we started producing ethylene, one of the key raw materials used in PVC, and we now manufacture about half of the ethylene that we previously procured from external sources in-house. We are currently striving to stabilize our raw material supply to ensure ongoing and steady production of PVC ahead of anticipated growth in demand.



PVC is primarily used in pipes and building materials, and PVC products contribute to resource conservation through their long service lives, which exceed those of other plastic products (PVC pipes have been assessed as

PVC-framed windows have superior thermal insulation properties (62% improvement in thermal insulation compared to aluminum-framed single-plane glass windows) that help save energy and contribute to the



Ethylene plant started operations in 2020

## **Support Digitalization and Environmentally Friendly Economics and Societies**

# Semiconductors

## Providing a Wide Range of Materials and Products That Are **Essential to Semiconductor Manufacturing**

To achieve sustainable societies, it is essential to improve productivity and efficiency through digitalization in all industrial fields while improving living environments and convenience for the general population. Also pressing is the need to establish environmentally friendly economies and societies through measures such as efficient energy use and the curtailment of greenhouse gas emissions.

Semiconductors provide foundational support for both digitalization and the implementation of environmentally friendly processes and policies.

The Shin-Etsu Group provides a wide range of materials and products, including silicon wafers, which are a core material used in the production of semiconductors, and other elements that are indispensable to semiconductor manufacturing, such as photoresists, photomask blanks and encapsulant materials.

Note: For individual product details, see the table below (Shin-Etsu Group products associated with the overall semiconductor manufacturing process).

#### Resolving Societal Issues with Our Products

## Support for the Development of 5G Technology through Semiconductors

5G telecommunications technology provides "high speed and high capacity," "high reliability and low latency" and "concurrent device connectivity." Accordingly, this technology is expected to greatly improve the convenience of both business and people's everyday lives while also being utilized to save energy and contribute to global environmental conservation.

5G technology will expand our capabilities in terms of both industry and our private lives by "supporting work styles for all locations," "eliminating labor shortages and reducing traffic accidents through fully automated driving" and "facilitating medical support in remote areas." Before this technology can be utilized, 5G-compatible telecommunications equipment and infrastructure must be established. A large volume of semiconductors that are superior in terms of performance, power efficiency and cost is utilized to construct these essential elements of 5G technology.

The Shin-Etsu Group supports the ongoing evolution of semiconductors, which advances forward day by day, by providing the necessary materials and technologies.

High reliabi and low latency

## Shin-Etsu Group products associated with the overall semiconductor manufacturing process



## Gallium Nitride (GaN)

Initiatives Targeting New Materials and Technologies

Semiconductors that utilize gallium nitride are expected to experience high demand due to their sophisticated properties and energy efficiency. These characteristics are required for the development of mobility technologies, such as electric cars, and 5G. Moving forward, the Shin-Etsu Group will aim to supply large-diameter GaN products.



#### **Quartz Fabric**

We are developing quartz fabric, which is optimal for use as a core material used in circuit boards that enable ultra-high-speed communication. This fabric is composed primarily of extremely thin threads of quartz glass, which enables film thinning on multilayer substrates and is effective in terms of preventing device malfunction caused by radioactivity, as it generates extremely low levels of alpha radiation. Quartz fabric also is garnering expectations as a component of fiber-reinforced plastic used in covers for 5G compatible wireless devices.







Thermal interface materials

Semiconductor devices



The completed semiconductor device is now embedded in the final product.

Final product



## Low Dielectric Constant Thermosetting Resins (SLK series)

The SLK series is high strength and has a low modulus and low dielectric constant. In fact, its dielectric constant and dielectric loss tangent are lower than those of any other thermosetting resin when used with superhigh-frequency 5G (10–80 GHz). It is also ideal for use in materials such as flexible copper-clad laminate (FCCL) and adhesives.

