

# Featured Topic: Group's Electric Products Shaping the Future through New Technologies

Downsizing and Frequency-heightening Mobile/Mobility Product Components



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## 1. Electronics Products of Our Group

The Sumitomo Electric Group, based on its core business of electric wires and cables that stemmed from the former Sumitomo copper business, has developed many unique products of wiring materials, raw materials, and parts and components in response to the needs of electronics market. The Group has continued developing new technologies and products that meet the demands of the times, such as compact, lightweight, environment-friendly, flame retardant, heat-resistant, or high-speed transmission products. The results are evident in various applications from goods familiar to us in our daily life, such as smartphones and tablet PCs, to highly advanced devices such as medical, automotive and aircraft equipment.

In the electronics field, the product range of wiring materials includes: 1) lightweight, heat-resistant, and flexible printed circuits (FPCs), 2) highly heat-resistant electron beam radiation cross-linked wires (so-called electronic wires), 3) coaxial cables with excellent high-frequency transmission characteristics, 4) multi-core cables for information equipment, and 5) flexible flat cables (FFCs) with excellent connector plug/unplug capability, all of which are designed and provided according to customer's requirements.

The Group has further cultivated and developed the material and processing technologies that underlie the above wiring materials business, resulting in further expansion of business domains with many unique raw materials, parts, and components. The products derived from the metallic material and plating technologies (both of which are basic technologies of conductive materials) include: 1) metallic material products such as lead wire products for electronic components, and 2) compound semiconductor products that are used for optical fiber communication lasers and white LEDs for lighting purposes. The products derived from polymer material technology and its associated precision processing technology (both of which are core technologies of insulating materials) include: 1) heat-shrinkable tubes that apply electron beam cross-link technology, 2) fluororesin-coated metal substrate products, and 3) porous fluororesin products. In recent years, the business of porous fluororesin products is

expanding to the field of micro-filtration modules that include water treatment.

## 2. Market Trends and the Group's Business Strategy

We are now facing rapid globalization and increasingly diversified customer needs in the electronics market. Electronics products are expected to further evolve toward downsizing, weight savings, high functionality, and upgraded performance, while becoming more modularized and commoditized.

In the field of consumer electronics such as portable devices, steady market growth in the future is expected due to the expansion of wearable devices such as head-mounted displays, in addition to the ever-enhanced performance of smartphones and tablet PCs.

The automotive sector is expected to grow further in the future. In particular, to achieve low fuel consumption in view of environmental concerns and to create a system for safe driving support, further development of electronic devices and materials is expected in the field of power drive control modules, LED modules for lighting and display, and automotive sensors and cameras to be installed in vehicles.

In the field of infocommunications equipment, the development of wireless modules that enable wireless charging and high-speed transmission at mobile base stations and the equipment part of such stations is expected. In the field of environment and energy, more energy savings and decentralized power supply systems are required. Under this situation, the market for power electronic semiconductors that enable highly efficient power conversion is expected to expand.

Today our Group is working toward the realization of VISION 2017, the medium-term management plan initiated in FY2013. The Group has a wide range of electronics-related businesses such as automobile, infocommunications, environment and energy, and industrial materials. Leveraging such strength in cooperation with business, sales, and research departments, we are expanding our business domains in response to

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ever diversifying global market requirements with the following strategy.

- (1) Strengthening our global manufacturing and sales system
  - Responding to diversified customer needs through efforts such as establishing specifications customization centers and ensuring flexible production responses
- (2) Strengthening new product development
  - Focusing on development of new products that integrate core technologies, such as FPCs for smartphones and tablet PCs, high-speed wiring harnesses, and automotive tab leads
  - Accelerating development of key device products
- (3) Expanding customers and business fields
  - Expansion of systems/units/modules and strengthening of solution proposals
  - Acceleration of strategies for broadening our user base

### **3. Our Group's Development Initiatives and an Overview of This Issue**

The Sumitomo Electric Group has continued the development of new products that satisfy the market needs of the times. For instance, our recent development of wiring materials includes: 1) high-definition and thinner FPCs for portable devices, 2) 150°C heat-resistant FPCs, 3) space-saving high-speed wiring materials that utilize high-speed transmission cables, 4) tab leads for electric vehicles, and 5) the next-generation high-speed interface Thunderbolt cable. Further, we also focus on the development of nano-conductive pastes and circuit forming nano-inks by applying our proprietary development of metal nano particle technology, and high-definition and ultra-thin FPCs, module components, and heat dissipating elements by using our adhesive material and circuit forming technologies. In the compound semiconductor field, we are working to develop high quality InP and GaAs substrates that are used for wireless electronic devices and optical devices for high-speed transmission that underlie infocommunications, blue-violet laser diodes and white LEDs, as well as a high quality GaN substrate that is applied to power devices, and substrates suitable for green lasers.

Out of these items, this issue focused on new technologies and products in the field of mobile and mobility products that are moving toward further downsizing and high-frequency electronic devices. More specifically, we introduce one topic on smaller and thinner FPCs, three topics on wiring materials for high-speed transmission, two topics on three-dimensional wiring modules such as wireless communication modules and LED lighting modules, and one topic on power electronics semiconductors.

Regarding smaller and thinner FPCs, we report on the thin double-sided FPC produced by paste via connection technology, a new interlayer connection technology that uses our developed nano-conductive

paste. By this technical development, we achieved further downsizing and thinning of the double-sided FPC and high circuit definition, which is already incorporated in our commercial production.

Regarding wiring materials for high-speed transmission, we report on each topic on FPCs, FFCs, and micro-coaxial cables. Regarding FPCs, we report on our achievement of the high-frequency transmission characteristics of 1-10 Gbps by structural optimization and application of low dielectric constant insulating materials. The product is expected to explore the applications in USB 3.0-compatible devices and mobile antennas for 4G LTE communications. Regarding FFCs, we report on one compatible with low voltage differential signaling (LVDS), i.e. the differential serial transmission technology, which significantly improved high-speed transmission characteristics by employing polypropylene-based adhesive with low dielectric loss. Regarding micro-coaxial cables, we report on the development of a direct attach cable for data centers that feature a narrow diameter and excellent flexibility achieved by the Group's accumulated know-how in micro-coaxial cables.

In the field of three-dimensional wiring modules, we report on two module products that contribute to downsizing and weight savings, by utilizing the flexibility of FPCs. The first topic is about a curved surface-mountable wireless charging module that replaced a winding coil with FPC for the first time in the industry. The module is expected to explore its applications in the wearable devices and health care equipment markets, which demand cordless charging. The second topic is about the application of 3D arrays, which is capable of forming various shapes, to wide light distribution LED modules. In this development, to suppress the emission efficiency reduction due to heat released by the LEDs, we achieved a new high heat release structure that significantly improves the thermal conductivity of FPCs.

In the power electronics semiconductor field, we report on the high-speed switching characteristics of a Schottky barrier diode and its behavior demonstration at low power consumption. The Schottky barrier diode is experimentally produced by using a high quality GaN substrate developed by our Group. GaN has better properties in breakdown voltage, on-resistance, and frequency compared with silicon, and its applications are expected to be explored in compact, highly efficient semiconductor devices for power conversion.

Wiring materials, raw materials, and parts and components are all essential items in the production of electronic products, which we can see everywhere in our lives today from the everyday goods we use to automobiles, environment and energy, health care, and aircraft. The Sumitomo Electric Group will continue promoting R&D for new products by constantly cultivating and developing our core material and processing technologies, in order to meet society's needs for environment-friendly products and market demands for higher performance products that are smaller, lighter, and faster.