Apr 25, 2007

Asahi Glass Succeeds in Mass Production of Low-Permittivity Fluorinated Polymer Dielectric Material for High-Frequency Devices

Asahi Glass Co., Ltd.

Asahi Glass Co., Ltd. (Headquarters: Tokyo; President: Masahiro Kadomatsu) has succeeded in volume production of a fluorinated polymer dielectric material featuring relative permittivity of 2.4 - 2.5, which is among the lowest in the industry. The new product is an organic coating-type insulating material that can be applied as interlayer dielectrics for wide-ranging high-frequency devices, including GaAs- and GaN-based compound semiconductors, and can be easily applied by spin coating method. With high thermostability (at up to 350 degrees C), the new material can be used in high-temperature processes. As a result, it is projected to be extensively adopted to uses requiring thermostability, for which fluoropolymers could not be used previously, and those utilizing thermosetting. Use of the material is expected to grow rapidly within our Electronics & Energy business.

In the development of high-frequency devices that are used in cellular phones and communication circuits, researchers are striving to realize higher operation frequency and lower power consumption. However, a technological challenge has appeared: with the operation frequency of devices growing higher, signal transmission speed drops and electricity consumption increases, which means that higher speeds have a greater effect on wiring capacitance. To resolve this problem, a material should be used that has lower permittivity than that of the polyimide-based dielectric materials (the relative permittivity of which stands at 3.2 – 3.5) currently in wide use.

Under our medium-term management plan ***"JIKKO-2007,"*** we aim to build Electronics & Energy as a third pillar of our businesses. As part of our efforts to achieve the goal, we have successfully developed a fluorinated polymer dielectric material that features low-permittivity characteristics and can be used in high-frequency devices, by making the most of our fluorine chemical technology, which is one of our core proprietary technologies. This low-permittivity dielectric material will make it possible to largely reduce wiring capacitance, raise the operation frequency of devices and slash power consumption. With moisture absorption of as low as 0.2% (when temperature is 85 degrees C and humidity is 85%), it can steadily maintain its characteristics. It is also excellent in planarization characteristics. Thus, the new material can enable multilayer wiring structures for devices, which will help improve yield rate.

We have started mass-producing this new material at our Chiba Plant , we will gradually deliver this product to our customers from now on.

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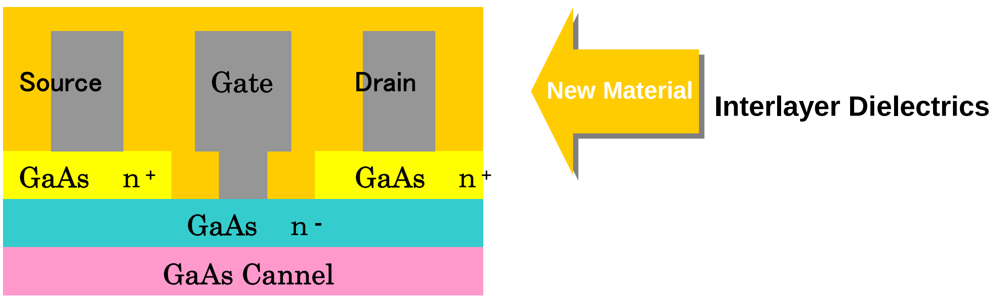
Reference
Example of adoption of the new material to GaAs-based compound semiconductor

GaAs substrate



Spin coat method

Technique to let resin spread out on the surface by centrifugal force by drip resin to the thing which wants to do a membrane made, and turning it.

High-frequency device

Devices that operate at high frequencies, and are generally used in communications and microprocessors. The wiring capacitance of their internal wiring is affected by materials characteristics more greatly than that of devices operating at low frequencies.

Wiring capacitance

When the number of wiring and dielectric layers increases in a device, a capacitance tends to be formed between wires, with deleterious effects.

Permittivity

While resistance value indicates “how hard it is for electricity to pass,” permittivity shows “how easily electricity accumulates.”

The relative value when the permittivity of air is deemed to be one is called relative permittivity.

Compound semiconductor

Semiconductors that are created by mixing more than one element with one another, rather than being comprised of a single element such as silicon and germanium.

Interlayer dielectrics

A layer of dielectric material applied as a coating between wires that are stretched three-dimensionally when integrated circuits of semiconductors are manufactured, so that the wires will not short-circuit.