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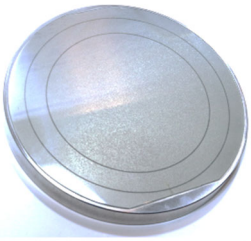
News Release

AGC Makes Additional Investment in Novel Crystal Technology, a Next-generation Power Semiconductor Material Developer

- Accelerating the Commercialization of Gallium Oxide Wafers -

Tokyo, June 30, 2020–AGC (Headquarters: Tokyo; President: Takuya Shimamura) has announced that AGC will make additional investment in Novel Crystal Technology ("NCT"; Novel Crystal Technology, Inc.; Headquarters: Saitama Prefecture, Japan; President: Akito Kuramata), a company engaged in developing a next-generation semiconductor material. NCT has already succeeded in developing, manufacturing and selling gallium oxide wafers up to 4 inches in diameter, and holds a nearly 100% global market share of these products. Through this additional investment, AGC and NCT will further accelerate the speed of development, aiming for commercialization of gallium oxide wafers in 2023.

4-inch Gallium Oxide substrate (On sale)



6-inch Gallium Oxide substrate (Under development)

Power semiconductors, which are found in a wide range of electric devices from servers to automobiles, industrial machinery and home appliances, are electronic components that function to control power. Since the performance of power semiconductors directly affects the energy efficiency, weight reduction and miniaturization of power control modules, the performance demanded from power semiconductors rises year by year. This has generated demand for semiconductor materials with lower power loss as well as higher voltage endurance and current handling capacities than the existing material, namely, silicon.

Gallium oxide is a next-generation semiconductor material whose power semiconductor figure of merit[*1] is over 3,000 times that of silicon. Even compared to other candidate materials under development such as silicon carbide (SiC) and gallium nitride (GaN), gallium oxide has the potential to be used at even higher voltages and currents, drawing major attention to this material.

AGC invested in NCT in 2018 and began joint development with the belief that gallium oxide mass production could be achieved at an early stage by leveraging NCT's innovative technological capabilities together with AGC's inorganic material mass production technologies, including the high-temperature melting, polishing, and cleaning capabilities that AGC has built up over the years in glass manufacturing. While efforts to date have succeeded in developing mass production technology for 4-inch gallium oxide wafers, AGC has decided to make an additional investment in the company with the aim of achieving even better quality and larger wafers in the future.

Under its ***AGC plus*** management policy, the AGC Group has made a commitment to positioning electronics-related business as one of its strategic initiatives. AGC intends to continue making aggressive capital investment in semiconductor-related business, which is expected to see significant growth in demand in the coming years as well, to contribute to further development of the semiconductor industry.

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Notes:

*1: Baliga's Figure of Merit (BFOM). When using 1 to represent the BFOM of silicon, the corresponding value of gallium oxide is 3444. See the table below for more details.

REFERENCE

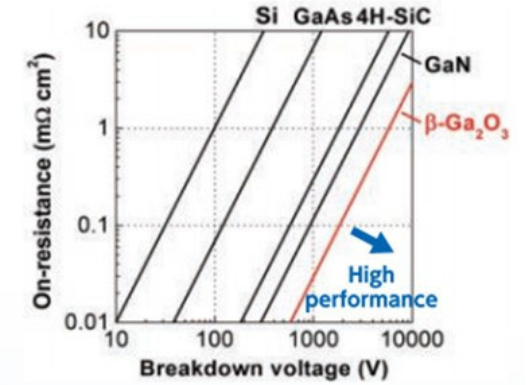
■ About Novel Crystal Technology Inc.

Established in June 2015, Novel Crystal Technology is a 'carve-out' venture from the Tamura Corporation and a technology transfer venture from National Institute of Information and Communications Technology (NICT). The company is engaged in the development, manufacturing and sale of gallium oxide single crystal substrates and epitaxial wafers, which are used as power semiconductor materials, as well as the development of power devices. In November 2017, Novel Crystal Technology, in collaboration with Tamura Corporation, successfully developed the world's first trench MOS-type power transistor made with gallium oxide epitaxial film. The company is focusing efforts on being a world pioneer in the practical application of gallium oxide-based power semiconductors.
https://www.novelcrystal.co.jp/eng/

■ Physical Properties of next-generation power semiconductor materials

	Silicon (Existing material)	SiC (4H)	GaN	β-Ga2O3
Baliga's Figure of Merit (BFOM)	1	340	870	3444 (estimated value)
Band gap (eV)	1.1	3.3	3.4	4.8
Dielectric breakdown field (MV/cm)	0.3	2.5	3.3	8 (estimated value)

The higher the Baliga's Figure of Merit, the lower the on-resistance when driving devices. (see figure below)



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