

Canon Optron develops oxide-type solid electrolytes for all-solid-state lithium ion batteries
Mass production to begin in 2023, contributing to the accelerated development of practical applications for all-solid-state batteries



Appearance of the developed oxide-type solid electrolyte
 Left: Granular type / Right: Pellet type

TOKYO, March 9, 2022—Canon Optron, Inc. (Headquarters: 1744-1, Kanakubo, Yuki City, Ibaraki Prefecture, Japan), in collaboration with the National Institute of Advanced Industrial Science and Technology (AIST), has developed an oxide-type solid electrolyte that can be sintered at lower temperatures than conventional solid electrolytes. In addition to high conductivity, the electrolytes have stability in air and can be supplied to a wide range of customers for a variety of applications. Canon Optron will exhibit the new oxide-type solid electrolytes at the 13th International Rechargeable Battery Expo BATTERY JAPAN, to be held in Tokyo from March 16 to 18.

Lithium ion batteries (LIBs) are used in mobile devices and automobiles. Recently, there has been increased attention focused on all-solid-state LIBs, in which the liquid electrolyte is replaced by a flame-retardant solid electrolyte. Among all-solid-state LIBs, those that use oxide-type solid electrolytes with high chemical stability are considered highly safe. However, there are problems with conventional oxide-type solid electrolytes in terms of low lithium ion conductivity and the formation during battery manufacturing of a resistive material that reduces battery output.

In response, Canon Optron has developed an oxide solid electrolyte that has high conductivity but can be sintered at a lower temperature than conventional solid electrolytes, thus suppressing the formation of resistive materials. The company plans to set up a production line for oxide solid electrolytes in its main plant in Yuki City, Ibaraki Prefecture, and start mass production and sales in the first half of 2023.

■ Realization of high conductivity over 10^{-5} S/cm

By adding specific heterogeneous elements to a crystalline material, which had never been the focus of attention as a solid electrolyte, Canon Optron has succeeded in significantly improving conductivity, a factor that affects battery output. This research on solid electrolytes has led to recognition of the value of such material, and a research paper on the subject has been published in the journal *RSC Advances*¹.

■ Low-temperature sintering

Conventional solid electrolytes need to be sintered at over 1,000 degrees during battery manufacturing. When heated at high temperatures, the mixed active materials react chemically and become a resistive material that inhibits the movement of lithium ions, resulting in batteries with insufficient output. Canon Optron's solid electrolytes are sintered at temperatures of approximately 600 to 700 degrees, helping suppress the chemical reaction with the active material and improving lithium ion output. The AIST has successfully produced simulated batteries that can be charged and discharged by mixing them with lithium nickel-manganese-cobalt oxide (NMC), lithium nickel-cobalt-aluminum oxide (NCA), or graphite, which are the active materials used in LIBs. In addition, this material realizes a lower environmental impact due to less thermal energy required for battery production, thus reducing carbon dioxide emissions.

■ Possesses stability in air

There is no change in conductivity even after exposure in open air for a certain period of time², thus allowing open-air handling and storage. Accordingly, the ease of handling this material makes it suitable for improving battery productivity.

¹ Published by The Royal Society of Chemistry. <https://doi.org/10.1039/D1RA02191E>

² Canon Optron has confirmed that there is no change in the ion conductivity after approximately one month for the granular type and after approximately eight months for the pellet type.

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13th Int'l Rechargeable Battery Expo BATTERY JAPAN

Date: March 16 (Wed) -18 (Fri), 2022

Access: Kokusai-Tenjijo Station (Rinkai Line) / Tokyo Big Sight Station (Yurikamome Line)

Venue: Tokyo Big Sight, East Hall

Booth: No. E39-9

Organiser: RX Japan Ltd.

Website: <https://www.batteryjapan.jp/en-gb.html>