NewsRelease

NIPPON SHOKUBAI

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Nippon Shokubai Succeeded in Improving the Performance of the Electrolyte for All Solid Polymer Batteries

NIPPON SHOKUBAI Co., Ltd. (Headquarters: Chuo-ku, Osaka City, President: Yujiro Goto, hereinafter "Nippon Shokubai") has succeeded in improving the performance of the electrolyte for all solid polymer batteries. All solid-state batteries using polymer electrolyte have features such as long life and high safety. On the other hand, the polymer electrolyte has poor lithium ion conductivity, so it is necessary to heat the battery to more than 50-degree Celsius. The newly developed polymer electrolyte shows high lithium conductivity performance. The operating temperature of the battery can be lowered near to room temperature. Therefore, new applications of all solid polymer batteries can be expected.

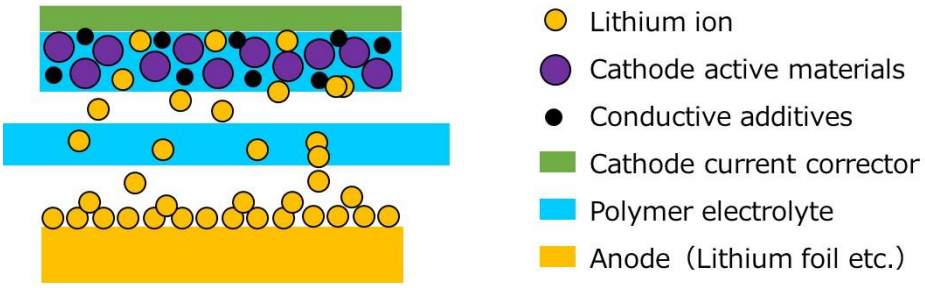

Fig.1 Configuration of all solid polymer battery

Nippon Shokubai developed a solid electrolyte consist of polyethylene oxide for lithium polymer battery and started commercial production around 2013. Generally, ionic conductivity of polyethylene oxide polymer electrolytes is lower than that of non-aqueous electrolytes for lithium ion batteries, and lithium ionic transport number is about 0.1 to 0.2. At room temperature, lithium ions move very slowly through the electrolyte. Therefore, in order to obtain stable performance, it was necessary to heat the battery to more than 50 degree Celsius for accelerating lithium ionic transport.

Several studies to improve the lithium ionic transport number of polymer electrolytes have been reported, but most of them are not able to improve the performance because of the low ionic conductivity. Nippon Shokubai have introduced the original ionic conduction mechanism that can achieve high performances. The new electrolyte films have almost same ionic conductivity and more than five times higher lithium ionic transport number compared to the conventional polyethylene oxide electrolyte films.

Table 1. Ionic conductivity and lithium ionic transport number

		25 ºC	40 ºC	60 ºC
New electrolyte film	Ionic conductivity (S/cm)	2.6×10^{-5}	8.2×10^{-5}	2.4×10^{-4}
	Lithium ionic transport number	**0.8**	**0.7**	**0.6**
PEO cross-linked film	Ionic conductivity (S/cm)	2.0×10^{-5}	1.1×10^{-4}	2.7×10^{-4}
	Lithium ionic transport number	–	0.1	0.1

The original electrolyte films have oxidation-reduction stability for lithium metal and 4V-class cathode active materials. The laminated cell batteries fabricated using this technology exhibited extremely high discharge characteristics than that of polyethylene oxide-based polymer. The dramatic improvement in battery performance leads to many potential benefits, including shorter charging times, higher energy densities, and reduction of devices for heating the batteries.

Nippon Shokubai will continue to contribute to high performance of polymer electrolytes for developing a new application. These researches are exhibited at Nippon Shokubai booth at the Battery Japan 2020, which will be held at Aomi Hall, Tokyo Big Sight on February 26 (Wed.) to 28 (Fri.).

About NIPPON SHOKUBAI Co., Ltd.: Since 1941, Nippon Shokubai has grown up its business with unique catalyst technology. Nippon Shokubai has supplied, for example, ethylene oxide, acrylic acid, automobile catalysts, process catalysts and so on. Among all, our global market share of superabsorbent polymer is the largest in the world now. Nippon Shokubai is a global chemical company operating under its corporate mission "TechnoAmenity-Providing affluence and comfort to people and society with our unique technology." http://www.shokubai.co.jp/en/

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