September 13, 2017

For Immediate Release

Company Nisshinbo Holdings Inc.
Securities code 3105

Notice regarding commercial application of carbon alloy catalyst utilized in electrodes for polymer electrolyte fuel cells

Nisshinbo Holdings Inc. (Nisshinbo) hereby announces that its carbon alloy catalyst[*1], a replacement for platinum catalysts, has been incorporated by Ballard Power Systems Inc.[*2] (Ballard) in a fuel cell stack product. This marks the first commercial application of a non-platinum catalyst in an electrode of a polymer electrolyte fuel cell (PEFC).
Ballard plans to start sales of the fuel cell stack that incorporates the carbon alloy catalyst from December 2017.

Electrode catalysts in PEFCs generally use platinum, a scarce and expensive material. Owing to their ability to generate power without CO_2 emissions, PEFCs are expected to be increasingly adopted as a green energy source going forward. Accordingly, the development of catalysts that can replace platinum has been a major challenge.
Nisshinbo's carbon alloy catalyst uses carbon as its key material, facilitating stable supply through industrial production. It does not contain any platinum, which is a scarce resource. By using our carbon alloy catalyst in air electrodes, Ballard managed to reduce its platinum consumption in fuel cell stacks by roughly 80%[*3].
Nisshinbo and Ballard have jointly collaborated on the development of a carbon alloy catalyst designed for application in PEFCs since 2013. These efforts have produced a carbon alloy catalyst that, inside a portable fuel cell usage environment, not only exhibits the same power generation performance as a platinum catalyst but also delivers enhanced durability. This carbon alloy catalyst was incorporated in a fuel cell stack by Ballard.

PEFCs are being adopted as residential and stationary fuel cells and they are already used in commercial applications in the automotive field as well. A similar trend can be observed in the industrial machinery, construction machinery, and other fields. At the same time, the market for electrode catalysts, a key component, is projected to expand to over 100 billion yen size by 2030. Nisshinbo is convinced its carbon alloy catalyst is a technology with the potential to further accelerate the adoption of fuel cells and expand the corresponding market.
In addition to accumulating achievements in the field of portable fuel cells, Nisshinbo Group is developing carbon alloy catalyst applications aimed at wider market, and intends to continue contributing to the realization of a hydrogen-powered society through the expanded adoption of PEFCs.

*1. Carbon alloy catalyst

A replacement for traditional platinum catalysts that uses carbon as its main material and has been developed by Nisshinbo in collaboration with Professor Junichi Ozaki of Gunma University since 2006. Nisshinbo succeeded in developing a catalyst with a high oxygen reduction reaction by optimizing the carbonization process and controlling the carbon structure of the catalyst surface.

*2. Ballard (listed on NASDAQ)

Headquarters: Burnaby, British Colombia, Canada

Sales: USD85 million (2016)

Leverages its strengths in PEFC technology to supply a diverse lineup of fuel cell core products ranging from large to small and portable models and geared toward large vehicles (buses, commercial vehicles, and trains) and material handling vehicles (backup vehicles and forklifts).

Its automotive fuel cells were used in buses deployed during the 2010 Olympic Winter Games held in Vancouver. (The bipolar plates used in the stack at the time was manufactured by Nisshinbo Chemical.)

[Nisshinbo's Relationship with Ballard]

1994	Started development of carbon bipolar plates for Ballard
1998	Started supply of carbon bipolar plates to Ballard (stationary use) Ever since, Nisshinbo has supplied carbon bipolar plates for emergency and test vehicles
2013	Started joint development with Ballard toward commercial application of carbon alloy catalysts (non-platinum catalysts)
2015	Invested USD5 million in Ballard

*3. PEFC electrodes consist of an air electrode that reduces oxygen and a hydrogen electrode that oxidizes hydrogen, both of which generally use platinum as the catalyst. By applying a carbon alloy catalyst that possesses oxygen reduction ability as the catalyst for the air electrode side, which utilizes more platinum than the hydrogen electrode, Ballard realized a substantial reduction in platinum consumption. (The hydrogen electrode side continues to use the conventional platinum catalyst.)