

Technology Development to Largely Reduce Platinum Catalyst in FCs

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1. Governmental Measures

(1) NEDO

On September 2nd, the New Energy and Industrial Technology Development Organization (NEDO) announced that a technology had been developed to convert coal into gas for electricity generation, and the conversion efficiency from coal to gas reached 82%. In this technology, coal is made into fine particles, and heated to extract inflammable gases such as CO and hydrogen. A pilot plant was built at a 20th scale of a commercial plant at the Wakamatsu Research Institute of J-POWER in Kitakyushu City. Hitachi developed the gasification reactor, and the technology achieved 5 to 10% higher generation efficiency than a plant developed by US-based GE. NEDO will experiment with fuel cell (FC) generation using gas produced by the Osaki Power Station of the Chugoku Electric Power Co. in Hiroshima Prefecture for further reduction in CO₂ emissions. Also, carbon dioxide capture and storage development is planned to be developed for more efficient CO₂ collection. (The Nikkei Business Daily, September 3, 2014)

(2) MOE

The Ministry of the Environment (MOE) has decided to start a model project to produce hydrogen as fuel for fuel cell vehicles (FCVs) by renewable energy such as solar and wind power. The project aims to establish an energy system which reduces greenhouse gas emissions by the total management of hydrogen production, transport and use. The system is expected to take an advantage of regional characteristics in cooperation with local government which should lead to using locally produced energy. (The Tokyo Shimbun & The Chunichi Shimbun, September 13, 2014)

(3) METI

The Agency for Natural Resources and Energy of the Ministry of Economy, Trade and Industry (METI) will start a model project to share electricity, heat and hydrogen energy efficiently in specified areas such as an urban area and industrial complex.

These areas contain businesses using energy in different

amounts and periods. Energy will be optimally shared between individual users while significantly saving energy over each facility using energy separately. The project will secure energy during emergencies by using an independent energy source such as cogeneration. Expecting a wide-range of ideas as well as plans, the agency will advertise for an operator in early FY 2015 for the model project to be able to work in other areas within three years. (The Denki Shimbun, September 19, 2014)

2. Local Governmental Measures

(1) Nagoya Chamber of Commerce & Industry

On September 3rd, the Nagoya Chamber of Commerce & Industry held a meeting with officials of Aichi Prefecture including Governor Hideaki Omura in Nagoya City to request support for industrial promotion. Mr. Omura said that the prefecture would assist the growth of next generation vehicles with a target of 100 hydrogen filling stations in the prefecture by 2020. (The Chunichi Shimbun, September 4, 2014)

(2) Tokyo

Tokyo is carrying out an investigation to introduce new public transportation, and will choose a partner for actual operations of the project by the end of October. "The New Tokyo Waterfront Sub-center has been chosen as a governmental strategic special zone as well as for the Olympics, and is expected to be developed more", says Governor Yoichi Masuzoe. He strongly expresses that Tokyo needs to make new public transport to support the area to suit the development and the event. Also a basic plan will be drawn up for actual operations including the use of FCVs. "Tokyo plans to develop a user- and environmentally- friendly new transport system" he says. (Architectures, Constructions & Engineerings News (Daily), September 25, 2014)

3. FC Related Element Technology Development

A group of Prof. Naotoshi Nakashima and Associate Prof. Tsuyohiko Fujigaya of the Department of Applied Chemistry of Kyushu University has developed a technology to reduce the

platinum used in FC catalysts to a tenth of that of conventional products. They used an original nano-layer technology to increase effective surface area while reducing the density of platinum particles fixed on base material surface in order to achieve the same catalytic function as a conventional product. The technology potentially reduces the costs of FC production. To fix platinum uniformly, the group coated carbon nanotubes (CNTs), the base material, with polybenzimidazole as glue. A smaller amount of platinum was added, and the platinum particles remained in small size rather than growing. The group compared between a FC with small platinum particles with a conventional FC with large platinum particles. The FC with small platinum particles achieved 10 times the current density of that of the FC with large platinum particles. An FC can theoretically produce electricity at the same level while reducing amount of platinum to a tenth that of a conventional product. (The Nikkan Kogyo Shimbun, The Denki Shimbun & The Chemical Daily, September 8, 2014; The Nikkei Business Daily, September 9, 2014; Japan Metal Daily, September 10, 2014)

4. Bio FC Development & Business Plan

Aisin Seiki, a major manufacturer of automobile components, has developed a new material for bio FCs which extracts hydrogen from sugars in sweet drinks such as a soft drink containing fruit juice to generate electricity. The material succeeded in doubling the output of a conventional product by crystallizing enzyme and increasing the durability with an original enzyme. The firm plans to rapidly commercialize the product as a pocket battery to charge smartphones. Aisin Cosmos R&D, a subsidiary for product development, in Aichi Prefecture, examined the material as joint research with Riken. Bio FCs use electrodes made with enzyme attached carbon fiber. The enzyme is generally attached to the electrodes using a solution. This limits the amount of enzyme per unit volume. The firm chose a structure where the enzyme can be easily orientated at an atomic level and crystallized, and made into a gel to attach. By controlling conditions such as an acidity level, the electrode was made with 100 times the density of enzyme than that of a product using solution. A cell was made with the electrode. When sweet drink containing sugar is added to the cell, the enzyme works as a catalyst to extract hydrogen. The output density improved to 8 mW/cm^2 , double of that of conventional products, by increasing the amount of enzyme attached to the electrode. (The Nikkei Business Daily, September 11, 2014)

5. Business Use FC Developments and Business Plans

(1) Bloom Energy

Bloom Energy Japan which is a joint venture in Tokyo of Softbank and US-based FC venture Bloom Energy in California will install its FCs in Osaka Prefectural Wholesale Market in Ibaraki City. The market will replace its diesel generator with a power source which has less impact on the environment. The FC system will power approximately 1,000 kW of facilities including refrigerators. The market buys electricity generated by the system from Bloom Energy, and details including the tariff of the contract will be discussed. (The Nikkei Business Daily, September 12, 2014; The Suisan-Keizai Daily News, September 16, 2014)

(2) Mitsubishi Gas Chemical

With NHK, Mitsubishi Gas Chemical has developed an uninterruptible power supply (UPS) using direct methanol fuel cells (DMFCs) as a backup power supply for a field pickup unit (FPU), microwave link, which is essential to transmit images during disasters and for emergency broadcasting. The UPS uses a large capacity AC rated 500 W DMFCs, and achieved a continuous operation of over a week without using power from the grid. Also, a lithium ion battery (LIB) in the system stabilizes the output. The firms plan to use the system for FPU to transmit images for emergency broadcast and during disaster, or backup power supply for a robot camera. A DMFC uses liquid methanol directly as its fuel rather than converting methanol into hydrogen gas. As well as their quiet operation, DMFC systems are a cheaper, safer and cleaner generator which does not emit hazardous gas as such as NOx and SOx. The developed system will be installed in FPU for its field test. (The Chemical Daily, September 19, 2014)

6. Ene-Farm Business Plans

(1) Misawa Homes Group

Misawa Homes and its three group members finished 10 houses of “M-Smart City Kumagaya”, a housing development in Kumagaya City, Saitama Prefecture, for the first sales, and held an opening ceremony on August 27th. The development is designed for using the wind for ventilation as well as cool spots with original materials to cool down the area. Each house is equipped with a photovoltaic generator, Ene-Farm, home energy management system (HEMS) and wall socket for an EV charger. All the houses are carefully designed to ventilate rooms to help the residents to feel cooler. (Jutaku Shimpo, September 2, 2014)

(2) Osaka Gas

On September 4th, Osaka Gas announced that the

accumulated sales unit of Ene-Farm reached 30,000. This can reduce electricity consumption up to 21 MW at peak times. Costing less than ¥2 million (catalog price), the FC system has been doing well since its release this April, which pushed the sales up. With a cooperating manufacturer, the firm will work on a further reduction in the price of FC systems. (The Yomiuri Shimbun, The Nikkei, The Sankei Shimbun, The Denki Shimbun & The Nikkei Business Daily, September 5, 2014; The Nikkan Kogyo Shimbun, September 9, 2014)

(3) Panasonic

Panasonic is considering producing core components for domestic FCs and smart gas meters at its Czech plant, a TV manufacturing base, to strength on its business in Europe. Currently components for domestic FCs and smart meters are produced in Japan, but the manufacturer wants to switch to local production for Europe for efficiency. In the autumn of 2015, a mutual supply of white goods will start with Bosch, a major manufacturer of automobile parts and electrical appliances. (The Nikkan Kogyo Shimbun, September 8, 2014)

(4) Toho Gas

Toho Gas will release Ene-Farm for apartment units using natural gas on October 1st. Their Ene-Farm is so far for houses only, and the new product will be sold to developers of new apartment houses. The product is to be installed in “pipe space” where water and gas pipes are stored by an entrance. The performance level is the same as the product for houses, and the new system is more airtight and earthquake-proof. According to the utility firm, the Ene-Farm is planned to be installed in an apartment house finishing in December 2016 in Nagoya City. Tokyo Gas and Saibu Gas have already release Ene-Farm for apartment units. (The Nikkei Business Daily & The Chunichi Shimbun, September 22, 2014; The Denki Shimbun, September 26, 2014)

(5) Toshiba

Toshiba Fuel Cell Systems, Yokohama City, announced that the Ene-Farm had been available since 2009 and the accumulated shipping unit reached 50,000. The new model was released in FY 2014, and the sales have gone up. The figure already made 12,000 units in less than six month for FY 2014. In contrast, the sales were 18,000 units for FY 2013. The new model can reduce approximately 1.6 tons of CO2 emissions, an equivalent of planting 112 Japanese cedars, each year. (The Nikkei Business Daily, September 24, 2014; The Denki Shimbun & The Nikkan Kogyo Shimbun, September 25, 2014)

(6) Tokyo Gas

On September 28th, Tokyo Gas started “Kininaru Project of

Tokyo Gas for FY 2014” which contributes to local governmental funds depending on its sales result of certain products including Ene-Farm. The project gives donations to the “Green Fund” of local governments according to annual sales results of Ene-Farm and “SOLAMO”, a domestic solar and gas water heater. (The Denki Shimbun, September 29, 2014)

7. Cutting Edge Technology of FCVs & EVs

(1) Tesla Motors

US-based Tesla Motors has revealed its new maintenance center in Totsuka-ku, Yokohama City to the media. Their luxury EV sedan “Model S” will be delivered from September 8th in Japan. The maintenance center can service 15 vehicles at same time. It also works as a showroom, and offers test rides. (The Nikkei, September 3, 2014)

On September 4th, Tesla Motors announced that its joint large-scale battery plant with Panasonic would be built in Nevada, next door to California where its headquarters is located. “Although this was a tough negotiation, we made a history and victory for Nevada” says Mr. Brian Sandoval, the governor of Nevada. He also emphasizes the significance of the plant that can expect approximately \$100 billion (approximately ¥10.5 trillion) of economic effect over next 20 years, and to increase the total production capacity of the area by 20%. Because the plant is an unusually large production base to be built these days, California, Texas and Nevada fought hard to attract it. Nevada had an advantage of closeness to the firm’s production base in California. “A large storage battery plant is essential to make economy EVs. Quick decision making of the state was the conclusive factor.” said Elon Musk, the chief executive officer (CEO) of Tesla, at the press conference. The firm will enthusiastically employ local residents and veterans, and contribute to local community by giving \$1 million to local universities to study storage batteries. (The Nikkei, September 5, 2014)

On September 8th, Elon Musk, the CEO of Tesla Motors, spoke to the Nikkei firm’s plan to develop an automatic driving system. The automatic driving technology is expected to be commercialized in next five to six years, and the firm plans to partially use the technology in its new car which is to be introduced into the market in three years and to sell for about \$35,000 (approximately ¥3.67 million). Their first luxury EV sedan “Model S” was delivered in Japan on the same day. Model S is the first commercial sedan for the firm, and drives up to 500 km on a single charge. The car boasts its high driving performance such as reaching 100 km/h from start as fast as in

4.4 second. Also a high performance semiconductor is embedded in the car to give it permanent internet access. The firm use information technologies as the base of automatic driving technology to accelerate commercialization of an EV with the automatic driving function which is an “ultimate safety technology”. Model S is expensive starting from ¥8.23 million; the firm decided to partially use an automatic driving technology in a new EV to be commercialized in about three years. Mr. Musk also said that all the Tesla’s cars would have automatic driving function in the future. In addition, the firm intends to cooperate more with Toyota and Panasonic to make EVs popular. (The Yomiuri Shimbun & The Nikkei, September 9, 2014; The Nikkei Business Daily, September 26, 2014)

Tesla will greatly expand its base in Hong Kong. The number of employees will be increased to 100, doubling the current figure, by the end of this year. The firm has decided to strengthen its sales structure, because Hong Kong has a lot of wealthy people and its luxury EV can attract them. (The Nikkei, September 27, 2014)

(2) Taiwanese Firms

On September 3rd, Taiwanese-based Hon Hai Precision Industry, the world’s largest electronic contract manufacturer, revealed its plans to start an EV related business in China. Although details of the plan such as investment scale are still unknown, they said clearly that their investment would be in Shanxi. This could be a contract for a plant for automobile assembly; the market considers that the manufacturer is trying to get a contract from US-based Tesla Motors. (The Nikkei, September 4, 2014)

Taiwanese-based Foxconn Technology Group plans to invest at least 5 billion CNY (approximately ¥ 85 billion) in a plant in Shanxi, China. Being the world’s largest electronics contract manufacturer, they aim to start business in the EV area. (Fuji Sankei Business i, September 5, 2014)

(3) Toyota

Toyota Motor has named its FCV which is to be introduced into the market in FY 2014 “MIRAI”. The car will be also sold with the same name in Europe. The manufacturer will make an official announcement including an outline of the vehicle in November. FCVs only discharge water as waste, and are called the “ultimate eco car”, and the firm will advertise its FCV as a Japanese innovative technology to the world. The name was picked from a selection, and “TOYOTA MIRAI” has already been submitted to the US Patent and Trademark Office to be trademarked. The FCV will be produced at Motomachi Plant in Toyota City at an annual 700 vehicle level to start with. The price is expected to be about ¥7 million before tax. (The Nikkei,

September 6, 2014; The Yomiuri Shimbun & The Asahi Shimbun, September 7, 2014; The Mainichi Newspapers, Japan Metal Daily, Nikkan Jidosha Shimbun & Dempa Shimbun; September 9, 2014)

On September 12th, Toyota Motor announced that a carsharing service using micro EVs would start on October 1st in Grenoble, France. The carsharing project will be carried out for three years in cooperation with Électricité de France. Being the first oversea test for the firm, it aims to investigate solutions for urban transportation problems such as traffic congestion and air pollution, and a similar project is being carried out in Toyota City in Japan. A total of 70 micro EVs will be available for hire in 27 car parks equipped with EV chargers in Grenoble. The service offers one way hire which allows EVs to be returned to any car parks. The city of Grenoble will provide the car parks, and the utility firm will install and manage the EV chargers. (Fuji Sankei Business i, September 13, 2014)

(4) Nissan

On September 10th, Dongfeng Nissan Motor, a joint venture of Nissan Motor in Guangdong in China, released EV “e30” of “Venucia”, a brand targeted for China. The EV uses “Leaf” as its base, and was developed specifically for the Chinese market. The price starts from 267,800 CNY (Approximately ¥ 4.6 million). The car drives 175 km on a single charge, and can be charged fully in four hours through a domestic wall socket. “We aim at 50,000 vehicle sales by 2018, and a 20% share in the Chinese EV market” said Mr. Susumu Uchikoshi, the managing director of Dongfeng Nissan, at a press conference in Shanghai. Dongfeng Nissan developed “e30” using technology of EV “Leaf” which was developed by Nissan and has been available in Japan and the US since 2010. “e30” will be produced at Huadu Plant, the main production base of Dongfeng Nissan in Guangdong. The Chinese government targets for accumulated 0.5 million vehicle sales of EVs and plug-in hybrid vehicles (PHVs) by 2015 and 5 million vehicles by 2020. (The Nikkei, September 11, 2014)

(5) Jorudan & Nissan Car Rental Solutions

On September 8th, Jorudan and Nissan Car Rental Solutions started a carsharing test using a total of seven EVs owned by both firms in Hakodate City, Hokkaido. Users can hire EVs from one operator and return them to the other. Nihon Unisys developed the system which organizes multiple letting operations, and Ubiteq made the on-board device for the rental cars. The test will last until November 29th. (The Nikkei, September 9, 2014)

(6) ABB & Chinese-based BYD

ABB, a major charger manufacturer, and BYD, a major

Chinese car manufacturer, have agreed to cooperate in technology development of storage batteries and the related services worldwide. BYD's battery technologies and ABB's power distribution technologies and client base in the electricity area will be combined to promote market growth of EVs and renewable energy. Both firm place special emphasis on the EV area. Having had high expectations, BYD's EV business in China has struggled. ABB knows where electricity is needed well. This will help to provide charging infrastructure preparation for EVs giving better access to users, which is essential for the EV market to grow. BYD aims to expand its EV business; this February ABB decided to supply quick chargers to a joint venture of BYD and Germany-based Daimler in China. (The Nikkei, September 9, 2014)

(7) Hyogo Prefecture

Hyogo Prefecture will install quick chargers for EVs in five more places. The chargers will be open to the public from September 10th in one town and four cities including Kobe, Nishinomiya and Akashi. Already 15 places are equipped with chargers, and the prefecture will have prepared 28 places with chargers in total by the end of FY 2014. It takes 45 minutes for a charge, and the service will be free for a while. (The Nikkei, September 10, 2014)

(8) LG Chem

On September 16th, South Korean-based LG Chem started considering supplying Nissan with next generation EV batteries. Major automobile manufacturers use LG's batteries. Selling batteries to Nissan allows LG to increase production capacity and to be more competitive in cost. As well as their plants in South Korea and the US, LG Chem plans to operate a new factory in Nanjing by 2015. Over 20 firms including US-based GM, Shanghai Automotive Industry Corporation Group and German-based Audi have supply contracts with LG Chem. (The Nikkei, September 17, 2014)

(9) Honda

On September 18th, Honda Motor announced that the price of its FCV to be introduced in 2015 would be the same level as the one from Toyota to be released earlier. The price is expected to be ¥7 to 8 million excluding purchase subsidy. The manufacturer plans to set the price to the same level as its current luxury range to promote its FCVs. According to an official, the development of the FCV has been carried out to achieve the release in 2015. As well as FCVs, the firm is developing batteries for EVs. However, their technology to expand the driving range largely on a single charge has not been solved yet. They plan to set FCVs as their key next generation eco cars. (The Nikkei, September 19, 2014)

(10) Chinese Government

The Chinese government will quickly organize governmental structures for standards such as the National Bureau of Standards to expand the EV market and industry. According to the Ministry of Industry and Information Technology, over 75 standards have been established in the EV area including finished EVs, components and chargers. Also, 77 standards are in process of either being newly established or revised. The ministry estimates that preparation of EV related standards is more advanced than other countries, and aims to set global standards in the area. (The Chemical Daily, September 19, 2014)

(11) TDK

TDK has developed a small power device for hybrid vehicles (HVs), and plans to produce it at a commercial scale by FY 2017. They developed a power supply component "DC-DC converter" to change voltage in HVs and EVs. This core component for HVs and EVs converts high voltage (100 to 400 V) from LIB into low voltage (ex; 14 V) to supply electric devices and lights. The weight is approximately 800 g, and the volume is 400 cm³. Being made smaller and lighter, the product will contribute to improving fuel efficiency of eco cars due to its enhanced conversion efficiency of voltage. (The Nikkei, September 22, 2014)

(12) Mitsubishi Motors

Mitsubishi Motors has designed a new version of its PHEV Outlander to be charged by a domestic wall socket, and announced this on September 22nd. The new vehicle is a medium size sport utility vehicle, and will be displayed in the Paris Motor Show starting from October 4th. (The Nikkei, September 23, 2014)

(13) ZTE Corporation

ZTE Corporation has started experimental use of a wireless charging technology for electric busses, which saves the trouble to plug in busses, in cooperation with Dongfeng Motor Corporation. (The Nikkei, September 25, 2014)

(14) Saitama University & Utsunomiya Electric

The group of Associate Prof. Yasushi Yamanou at Saitama University and Utsunomiya Electric, which manufactures and sells fuse in Tokyo, has developed a fuse for EV wiring. They designed the shape of the fuse to reliably protect batteries and devices by cutting off too large a current. Conventional products sometimes take time to shut off small excess current. The price of the new product is expected to be at the same level as conventional products. The group aim to commercialize the product in FY 2014. (The Nikkei Business Daily, September 26, 2014)

8. Hydrogen Filling Station Business Plans

(1) Toyota Tsusho

Toyota Tsusho has held a ground breaking ceremony of the “Nagoya Atsuta Hydrogen Station”. Being the first commercial one in the center of Nagoya City, the filling station will supply hydrogen to FCVs that Japanese automakers plan to release in 2014 or 2015. The firm will prepare another hydrogen filling facility near the Toyota Interchange of the Tomei Expressway in Toyota City. This facility will be installed at an established gasoline filling station. To be a “multi-fuel supplier”, the filling station will be largely converted to fit in the regulations in order to accommodate FCVs as well as gasoline cars. The two hydrogen filling stations are planned to be open next January. The construction costs will be ¥500 to 600 million each with a governmental subsidy of ¥190 million. The filling stations will be operated by “Toyota Tsusho Air Liquid Hydrogen Energy Corporation”, a joint venture with Air Liquide Japan. (The Asahi Shimbun, The Nikkan Kogyo Shimbun, Japan Metal Daily & Nikkan Jidosha Shimbun, September 2, 2014; The Denki Shimbun & The Chemical Daily, September 3, 2014)

(2) Honda

On September 18th, Honda Motor announced that its small hydrogen filling station had been developed to fit in a container, and was placed in Saitama Eastern Area Environmental Center, a waste incineration site. They will test the product for about three years in cooperation with Iwatani and Saitama City to commercialize it as soon as possible. The automaker reduced installation costs to ¥50 million, a tenth of that of a conventional hydrogen filling station, to support FCV market growth. The new filling facility produces hydrogen by electrically splitting water. The Environmental Center provides the filling facility with electricity generated by heat from its waste incinerator. Because the filling station has a smaller supply capacity, the firm expects it to be used at governmental organizations and businesses which have a few FCVs. (The Yomiuri Shimbun, The Asahi Shimbun, The Nikkei & The Nikkei Business Daily, September 19, 2014; Nikkan Jidosha Shimbun, September 20, 2014; The Denki Shimbun, The Nikkan Kogyo Shimbun & The Chemical Daily, September 22, 2014)

(3) Kobe Steel

Kobe Steel has organized a cross departmental project team to develop hydrogen filling station in its compressor business. The production system of their Takasago Plant will be reviewed to shorten the delivery time by 30%. They aim for over a 50% share in the domestic market by FY 2020. According to them, their products are used in six hydrogen filling stations out of 18

prepared in FY 2013 in Japan. The product released this spring combines an own compressor and heat exchanger, which reduces by approximately 50% the installation area and entails 80% of the construction costs, which is approximately ¥250 million of that of a conventional product. (The Nikkei Business Daily, September 26, 2014)

9. FC & Hydrogen Related Measuring/Observing Technology Development & Business Plan

Sinfonia Technology plans to develop equipment to evaluate the basic performance and durability of FCVs. As well as power sections such as motors, the new product aims to assess FCs, which is the power source for FCVs, in a unified way in collaboration with industrial gas producers. The firm has the largest share in testing equipment for EVs in Japan, and leads the way in the testing equipment for FCVs. Testing instruments for automobile development simulate various driving conditions to assess the durability and basic performance of engines, transmissions and motors. (The Nikkei Business Daily, September 8, 2014)

- This edition is made up as of September 29, 2014-