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Automotive News

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Turning wood and orange peels into car parts stronger than steel

Masumi Suga and Kiyotaka Matsuda
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TOKYO (Bloomberg) -- The molecules of plant fibers are being transformed into a lightweight material five times stronger than steel that can be used to make everything from auto parts to electronic displays.

No wonder the technology, called cellulose nanofiber, has piqued the interest of executives in Japan, where manufacturers import almost all the metal and fuel they need. The new material is derived from common things such as trees, rice straw and orange peel, which means supply is plentiful and more environmentally friendly than what's used now.

While development is in the early stages, the government estimates domestic sales may be worth about 1 trillion yen ($8.3 billion) in 15 years. The first commercial product is already out: a $2 pen that Mitsubishi Pencil Co. sells in North America. Cellulose nanofibers are also going to be an ingredient in adult diapers planned by Nippon Paper Industries Co., while Nissei Co. is considering using the stuff to slow the melting of soft-serve ice cream.

"Cellulose nanofiber itself could be an ace-in-the-hole for Japan's industry," said Hiroyuki Okaseri, a senior pulp and paper analyst at SMBC Nikko Securities Inc. in Tokyo.

At a time when developed countries are looking for ways to curb carbon emissions, Japan sees commercial development of a plant-based building material as an attractive option to metals that require fossil fuels to mine, transport and process ore. The steel industry is the nation's top polluter among manufacturers, accounting for more than 40 percent of industry emissions, government data show.

Paper shift

Leading the charge to a plant-based alternative are companies connected with the paper industry in Japan, where about 70 percent of the island nation is covered with forests. They're looking for new markets and revenue as Japan's shrinking population and the shift to more online content erode demand for books, newspapers and paper documents.

Seiko PMC Corp., a maker of chemicals for the paper industry, is offering potential customers cellulose nanofiber samples made at a pilot plant that began operating last year in Ibaraki prefecture, north of Tokyo. Papermaker Oji Holdings Corp. has teamed up with Nikko Chemicals Co. to develop the material for use in cosmetics such as cream foundations, gels, shampoo and mascara.

"Paper producers must work on structural reform," said Masayoshi Watanabe, director for the industry at the Ministry of Economy, Trade and Industry. "The faster they respond, the more likely they will win a global race."

Reviving growth

Developing cellulose nanofiber has gotten the backing of the government under measures enacted by Prime Minister Shinzo Abe intended to revive Japan's stagnant economy.

The trade ministry has asked for 450 million yen for the year starting April 1 to develop the manufacturing process and study how the material can be used. In cooperation with the auto industry, the Ministry of the Environment sought 3.8 billion yen to assess the potential for improved fuel efficiency and lower emissions by using the lighter-weight material in vehicles.

While replacing steel won't happen immediately, car bodies made of cellulose nanofiber are a possibility, according to Kentaro Doi, director of the environment ministry's climate-policy division. The economy ministry estimates automotive uses could account for as much as 60 percent of the 1 trillion yen market within 15 years. That figure could rise many times when markets outside Japan are considered, Watanabe said.

Lighter vehicles

Competition to develop new materials for the auto industry is heating up as stricter emissions rules force companies to look for ways of making their vehicles more fuel efficient, including with materials that weigh less than metal. Steel suppliers have responded by designing lighter and more

advanced alloys. Carbon-fiber maker Teijin Ltd., based in Osaka, is working with General Motors to design super-light composite- plastic cars in the same way airplanes were re-engineered with less metal.

Hurdles remain for cellulose nanofiber, which still costs more than conventional materials and faces competition from other new technologies, like Canada's nanocrystalline cellulose. Japan produces about 50 tons a year of cellulose nanofiber at a cost of roughly 7,000 yen a kilogram, or $58,500 a metric ton. By comparison, copper on the London Metal Exchange fetches about $4,958 a ton. The price could drop to 300 yen a kilo by 2030 as output rises to 225,000 tons, according to Japan's trade ministry.

"At issue is whether the material will overcome the hurdles of costs," said Hiroyuki Yano, a professor at the laboratory of active bio-based materials at Kyoto University who has been studying the development of cellulose nanofiber since 1998. "Japan has plentiful forest resources and also has industry trying to utilize them. Japan could become a resource-supply nation."

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