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Syzygy Plasmonics and Lotte Chemical unlock Ammonia as a Hydrogen Carrier in Asia

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The world's largest all-electric ammonia cracking system has been commissioned and tested by Syzygy Plasmonics and Lotte Chemical in Ulsan, South Korea with logistical support from Sumitomo Corporation of America and Sumitomo Corporation Korea. This marks the second installation of Syzygy's Rigelâ?¢ reactor cell, the other located at the company's demonstration facility in Houston, Texas.

The results in Ulsan confirm the viability of using ammonia as a hydrogen carrier, drawing on positive results from over 2500 hours of testing in Houston. This paves the way for energy importing regions such as Korea to import clean ammonia.

The new clean ammonia segments being developed will fundamentally speed up the growth of the ammonia business. Those new segments are forÂ **shipping fuel, power production, ammonia as hydrogen carrier and clean fertilizer for food segments**.

Low-carbon hydrogen is widely seen as a key to reducing global emissions. However, it must be compressed, liquefied, and transported at -423Â°F(-253Â°C) in order to reach energy-importing countries.
The combination of nitrogen and low-carbon hydrogen from regions with renewable electricity yields low-carbon ammonia, which is easier to store and transport. With Syzygy's Ammonia e-CrackingTM systems, ammonia can be cracked on site to provide low-carbon hydrogen energy importers. The successful testing of this technology opens the door to the hydrogen economy.

Dr. Suman Khatiwada, Co-founder and CTO at Syzygy said "Lotte and Syzygy made history with this project. This is the breakthrough that Korea, Japan, and Eastern Europe have been waiting for. They now have an efficient, proven way to crack imported ammonia for hydrogen."

With support from Sumitomo Corporation Group, Lotte installed a Rigel cell at its Ulsan facility, completed plant construction in November, and completed field testing in December 2024. The Rigel cell quickly achieved desired performance levels following KOSHA certification and installation. During separate testing phases, the cell produced all-time best results of 11 kWh/kg, 81 percent energy efficiency, 99 percent conversion, and 290 kg/d of hydrogen with steady-state operation. In future Rigel cell designs, Syzygy will be able to achieve 8 kWh/kg of hydrogen.

"We look forward to commercializing this technology in South Korea. Over the coming years we plan to work with Syzygy to identify a suitable application for building a small commercial plant together, which will be a big step towards meeting South Korea's growing hydrogen needs," said Hans Shin, Project Manager at Lotte Chemical.