

JJNS, Leading the Development of Innovative Soundproofing Solutions that Defy the Mass Law

About the Company

Established in 2020 as a venture enterprise specializing in metamaterial platforms, JJNS is currently operating in the Daejeon Center for Creative Economy and Innovation located at the Korea Advanced Institute of Science and Technology (KAIST), in Daejeon. JJNS develops and provides soundproofing materials used for reducing EV road noise and noise from upstairs in apartment buildings, and its 10 members include the CEO and key developers specializing in physics and acoustic systems. Products include Wave META, a patented high-performance and light-weight soundproofing material developed with advanced technologies to reduce the composite road noise of EVs. Wave META was developed by addressing the limitations of existing competing products and improving their strengths to optimally reduce noise.

Background

The strengthening of global carbon emission regulations and the announcement of the Fit for 55 package are ushering in a world where cars powered by internal combustion engines will no longer be produced after 2035. In line with the trend, the EV industry achieved a remarkable growth in the last few years along with the

rapid growth of related technology and markets. Nevertheless, soundproofing materials used in the existing transportation industry must be improved in density and thickness to ensure their performance, but their development is at a standstill due to difficulties in effectively blocking low-frequency noise such as that generated on road surfaces. Using existing materials on EVs will lead to serious problems as they will reduce the internal space and compromise fuel efficiency. Committed to overcoming the physical limitations of existing soundproofing materials, JJNS developed Wave META, an innovative, light-weight material with low density that effectively blocks low-frequency waves, which are the key properties of noise.

About the Product

Wave META is a soundproofing material that defies the mass law of sound by using its technology based on acoustic meta-structure that adjusts the effective density of air. The Multi Anti-resonance mode Technology (MAT) incorporated in the product can block low-frequency noise (below 500 Hz), which is the main cause of road noise and noise between floors, more than 10 times more effectively than rubber products. It is also very light, weighing less than 60 percent the weight of existing soundproofing materials, and the light-weight material



Photo 1. Wave META used for reducing NVH of EVs (left) and Wave META used for reducing noise between floors (right)

can selectively block the frequency of the desired band. Wave META is designed as a patterned modular type that combines a mode-implemented structure and a thin elastic membrane structure, which enables the product to be applied to the desired area. The performance of Wave META's large-sized version (4m x 3m) was verified by the Korea Laboratory Accreditation Scheme (KOLAS), and its technology and design patents have been applied or registered in Korea and the United States. In the initial business stage in 2021, JJNS was selected in Hyundai Motors' ZERO1NE Project and partnered with Hyundai Motors and Hyundai NGV to develop meta-structure wheel guards used in EVs. Selected in the Tech Incubator Program for Startup Korea (TIPS) in 2022, JJNS is developing EV parts that produce noise, vibration, and harshness (NVH) such as wheel guards, floor carpets and luggage boards by applying Wave META for reducing EV indoor noise. The company's R&D Center completed the production of a prototype through continuous optimization and further development of elemental technologies, with the aim of verifying the product in real-world testing in 2023.

Starting from 2023, JJNS applied Wave META's technologies to ultrasonic sensors and succeeded in improving the detection range by more than twice the existing range, and plans to expand the business area to vehicle control systems of EVs and electrical control systems used in other industries.

Competitive Edge and Business Strategy

The company's competitiveness is based on its ability to develop materials that are technologically differentiated from other competitors and can be applied to various industries as they are developed by using metamaterial design, analysis, optimization algorithms, manufacturing, and measurement system technologies. In addition, the expertise and product planning capabilities of its excellent team members enable the company to excel at metamaterial application and commercialization.

In the beginning stage, JJNS plans to apply Wave META to noise reduction. The biggest advantage of the soundproofing material lies in its light-weight and thin

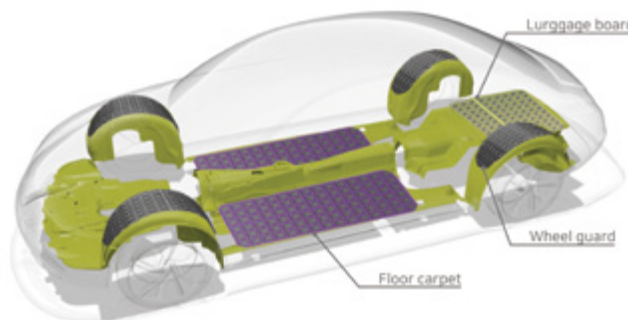


Photo 2. A conceptual diagram of installing Wave META for reducing indoor noise of EVs

properties, which effectively blocks noise independent from spatial constraints. In addition to EVs, its low cost and excellent compatibility enable application to other business areas such as construction, ships, and machinery.

The product's business model is to initially enter the market by manufacturing products applied to wheel guards, floor carpets and luggage boards, which are made of PP and can attach to insulation, so as to improve the NVH performance of EVs. After stabilizing sales, JJNS plans to enhance market competitiveness by saving production costs and strengthening supply capabilities through the establishment of in-house production lines. The final stage will be to participate from the early stage of EV parts development to further expand NVH parts applied with Wave META such as headliners, trunk mats, trunk sides and undercovers so that they can reduce noise and vibration from the outside and absorb noise generated indoors.

Additional business areas include products that are installed to the ceilings of buildings to reduce noise between floors. JJNS was selected as a partner for a project led by the Korea Institute of Civil Engineering and Building Technology (KICT) to solve various problems arising in residential areas and plans to apply Wave META in the project.

Future Plans

- **Accredited testing and standardization**
 - Real-world tests and test reports
 - Durability and environmental tests
- **Establishment of a mass production system**
 - Introduction of infrastructure for the mass production of Wave Meta and establishment of production lines
 - Introduction of a smart factory with an automated production system
- **Launching products used for reducing NVH of EVs (early 2024)**
 - Launching of Wave META applied to wheel guards for blocking road noise
 - Launching of Wave META applied to floor carpets for blocking wind noise
- **Development of sales channels for exports to mobility companies in the US, Europe, India, etc.**

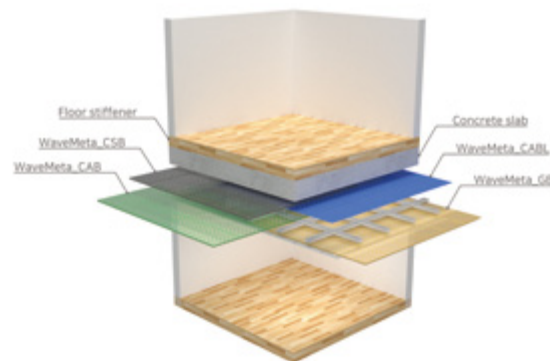


Photo 3. A conceptual diagram of installing Wave META for reducing noise between floors in buildings

- **Business expansion to building materials and interior design markets**
 - Signing of an MoU for joint R&D with Hyundai Engineering for reducing floor noise and pilot application to sample households
 - Introduction of Wave META in households supported by the Korea Institute of Civil Engineering and Building Technology
 - Expansion to interior design projects implemented in aged apartment buildings and commercial buildings
- **Commercialization of acoustic enclosures (ships, airplanes, spacecraft, etc.)**
- **Attracting investment**
 - Pre-A series in the first half of 2023 with target to attract KRW 800 million
 - Completion of initial investment of KRW 300 million from the Korea Science and Technology Holdings (December 2021)

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** The opinions expressed in this article are the author's own and do not reflect the views of KOTRA.*