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CASE STUDY I HIPOWER ENERGY

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Polish scientists have developed a technology that solves the problem of hydrogen loss during storage, transport and transmission. It is also being implemented by a Polish company - hiPower Energy - which estimates the hydrogen tank market to be worth \$1.5 billion.

Polish researchers at the Wrocław University of Technology have developed technology to solve the problem of losses in hydrogen storage and transport.

Its commercial implementation has also been taken up by the Polish company hiPower Energy, whose company, hiPower Institute of Materials, has developed technology to protect the penetration of hydrogen particles through the tanks and pipes in which hydrogen is stored and transported.

The effectiveness of the Polish technology was confirmed in a certified hydrogen tank testing laboratory in Germany. The result confirmed an almost 100 per cent efficiency of hydrogen gas retention in the tank.

Hydrogen is set to be the fuel of the future, especially for industry, for which it may be the most effective way to decarbonise. However, we are still at the beginning of the development of the hydrogen economy. In particular, investment is needed in generating sources of green, or the most desirable, emission-free hydrogen, which today accounts for only 1 per cent of global production. As much as 70-80 per cent of this gas is still produced globally by reforming petroleum-based fuels, mainly methane.

The storage and transport of hydrogen remains a challenge. Due to its characteristics, the particles of this gas penetrate practically every barrier, so hydrogen losses due to permeation are currently measured in the tens of billions of dollars. The annual hydrogen loss for a single transport platform, consisting of several tanks, can be as much as 1 000 kilograms of this valuable gas.

With a solution to this problem come Polish scientists, working with Polish business within the hiPower Institute of Materials. The hiPower Institute of Materials, which specialises in the development and commercialisation of functional surface layers derived from sol-gel technology, joined the hiPower Energy group in 2024. The innovative materials, with efficacy proven by laboratory tests, increase the tightness of tanks for the storage and transport of hydrogen and other problematic substances. The advantages of the new generation of coating materials enable their wide application also in medicine, industry and the construction industry.

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It is a company of the NewConnect-listed hiPower Energy Group (formerly Areny.pl SA), which has developed a technology that protects the penetration of hydrogen particles through the tanks and pipes in which hydrogen is stored and transported.

The technology of Polish scientists being implemented by a Polish company could revolutionise the hydrogen industry worldwide.

Developed by researchers from the Wrocław University of Technology working with the hiPower Institute of Materials (IoM), the innovative barrier coating, together with a comprehensive application and validation system for any surface, including geometrically complex and large-format surfaces, is set to revolutionise the hydrogen industry.

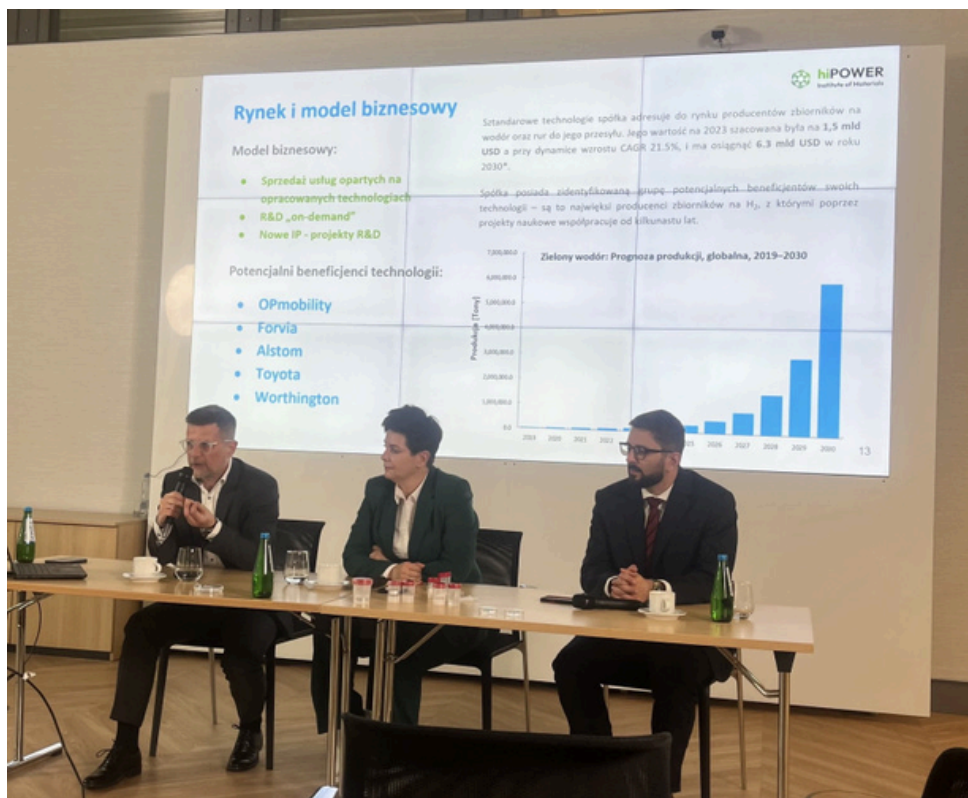
This technology - according to the assurances of its authors - solves the problem of hydrogen loss during storage, transport and transmission, due to the hitherto unattainable tightness of the sol-gel coating developed by hiPower IoM.

The company has exclusive rights to the know-how reservations, which are the basis for the creation of innovative barrier layer technologies that minimise hydrogen loss. It also owns the 'FineCoat4PressureVessel' multilayer coating system, the use of which guarantees the preservation of the unique properties of the functional layers.

The effectiveness of the Polish technology was confirmed in a certified hydrogen tank testing laboratory in Germany. The result confirmed an almost 100 per cent efficiency of hydrogen gas retention in the tank.

Thanks to the work of the research team, it has been possible to obtain a layer that virtually fully protects the hydrogen from penetrating the Generation IV tanks currently used for hydrogen storage.

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Sol-gel coating technology can also have much wider applications than just the hydrogen industry.

The innovative barrier coating is based on the sol-gel method, which allows multicomponent materials to be obtained directly and therefore without the need for intermediates or costly processing technologies. Sol-gel technology offers a wide range of possibilities in the area of surface refinement coatings for a variety of materials. Thanks to its use, our research team has already developed, among other things, insulating mats based on aerogels and recycled PET, a range of anti-corrosive, adhesive and self-healing coatings, as well as nanometric and submicron powders that will find application in various industries.

These coatings can be used to cover metals, polymers, glass, virtually any surface, so the Polish technology can have a really wide range of applications. An example is the coating of a windmill mast, which will make the structure resistant to the harmful effects of weather conditions, for example. In the medical industry, coatings with biological activity will allow various types of medical implants to be coated, e.g. for the controlled release of medication into the body.

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The technology developed provides a technological foundation on which specific functional solutions can be built for various industries, ranging from the hydrogen management industry to the construction, textile, medical and metallurgical sectors.

The hiPower IoM company is mainly targeting manufacturers of hydrogen tanks and pipes for hydrogen transmission. The company estimates that this market is worth US\$1.5 billion and could be as high as US\$6.3 billion by 2030.

Ultimately, the company wants to offer its own kind of R&D on demand, meaning that it will adapt its technologies to the needs of its customers.

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