

# PRESS RELEASE

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## LIST AND 3D-OXIDES INVEST IN THE HYDROGEN SECTOR

**LIST and the company 3D-Oxides set up a joint laboratory to accelerate the discovery of new functional materials allowing the development of the Hydrogen sector in Luxembourg.**

The race for clean energy production has started. Hydrogen, which is a zero carbon fuel, is a serious lead, but for the moment complex to implement and very expensive. Water fractionation, which consists of removing hydrogen and oxygen from water, is one of the avenues envisaged for producing hydrogen for fuel cells, in particular for mobile applications (car, telephone laptop, PC, etc.). Research in this area is focused on improving technologies to make water fractionation easier and more affordable to implement.

LIST has teamed up with 3D-Oxides, a French company that develops functional materials with extraordinary properties (for example conductors, photo-catalytics, self-cleaning, etc.) using Chemical Beam Vapor Deposition (CBVD). The partnership with 3D-Oxides, that began in April 2020 for a period of four years, aims to conduct a research programme focused on energy, and in particular on the development of new materials for the hydrogen industry necessary for the creation of battery fuel with low catalyst content, the development of new generation electrolyzers or high performance photolysis systems. "What is quite remarkable in this partnership is the possibility of strengthening our overall strategy in the Materials department of LIST centred on the accelerated development of new functional materials. Imagine the evaluation of a dozen different chemical compositions in a single experiment and the coupling between the power of these manufacturing processes and the advanced modelling by HPC of these same materials. We offer it all under one roof! ", notes Dr Damien Lenoble, Director of the LIST Materials Department.

### **Make water fractionation more efficient and profitable**

To fractionate water, 3D-Oxides and LIST rely on the photolysis of water. The HEPHOTO project aims to explore a more efficient photocatalyst material (NaTaO<sub>3</sub>). This project, supported by the National Research Fund via the Bridges programme, will develop a functional material used in photo-electro-catalytic processes to separate hydrogen and oxygen. This approach will make it possible to obtain, in a single step, very efficient photo-electrodes making it possible to fractionate the water.

### **Technology and equipment to move up to the pre-industrial scale**

3D-Oxides' expertise lies in mastering the CBVD (Chemical Beam Vapor Deposition) processes. This thin film deposition technology, which allows processing several materials at the same time thanks to a combined approach, represents an innovative way to deposit materials in softer conditions, well controlled and in a single step. LIST will be armed with the equipment of CBVD "Sybilla 450", a very unique machine which can treat substrates with diameters up to 450 mm, a substantial size allowing the generation of photo-electrodes in large numbers or of sufficient size for relevant usage tests. "We are happy to use LIST's expertise in the field of hydrogen generation, and are proud to bring our knowledge regarding thin layers and the unique processes in the world that we have developed, such

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The Luxembourg Institute of Science and Technology (LIST) is a mission-driven Research and Technology Organization (RTO) that develops advanced technologies and delivers innovative products and services to industry and society. As a major engine of the diversification and growth of Luxembourg's economy through innovation, LIST supports the deployment of a number of solutions to a wide range of sectors, including energy, IT, telecommunications, environment, agriculture, and advanced manufacturing at national and European level. Thanks to its location in an exceptional collaborative environment, namely the Belval Innovation Campus, LIST accelerates time to market by maximizing synergies with different actors, including the university, the national funding agency and industrial clusters.

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as 3D printing for thin layers with sub-micrometric resolutions allowing us to obtain new material properties”, exclaims Giacomo Benvenuti, the main founder and Technical Director of 3D-Oxides.

LIST will bring its expertise in the synthesis of functional materials in thin layers, in the characterisation of these materials and in the prototyping of functional devices.

### **Hydrogen production: LIST explores several alternatives**

The Materials Department of LIST has made energy one of its strategic axes and is exploring several alternative approaches that make it possible to envisage the hydrogen sector as a serious solution to the energy challenge of the 21st century. In addition to the HEPHOTO project, Dr Nicolas Boscher's CLEANH2 project aims to develop a new class of materials for the clean and efficient production of hydrogen from the solar electrolysis of water. Nicolas Boscher will create photocatalytic polymers assembled from chlorophyll derivatives (porphyrins). It is by exploring multiple avenues that LIST intends to contribute to supporting a new economy built not on fossil fuels but on hydrogen.

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