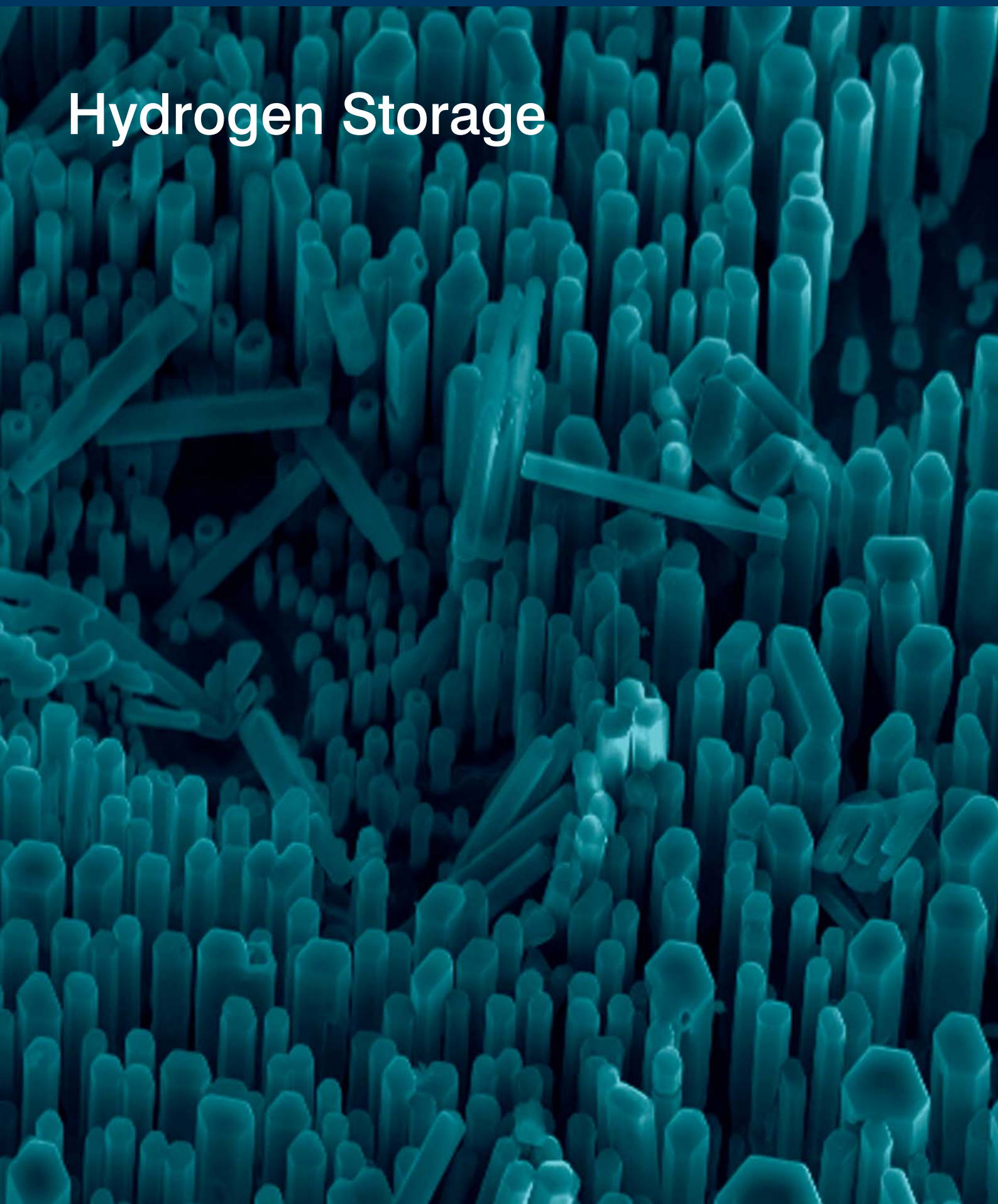


Hydrogen Storage



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Research at the University of Glasgow in to the solid state storage of hydrogen could pave the way towards hydrogen powered fuel cells being used on a commercial scale, eventually replacing carbon-based fuel in cars and aeroplanes.

If research being carried out by Professor Duncan Gregory in partnership with a new start-up company is successful, it could usher in a new generation of cleaner fuels for cars and aeroplanes – as well as other applications such as refrigeration and air conditioning – that would make a significant impact in reducing CO2 emissions and global warming.

Plane manufacturer Boeing has already successfully tested a manned aeroplane using hydrogen to power fuel cells that create electricity to power an electric motor on the plane. While hydrogen is a clean commodity producing only water on combustion, it can be expensive and difficult to store safely, which currently hold it back from widespread use in industry as a replacement for fossil fuels.

Another problem with storing hydrogen to power fuel cells for mobile applications like cars and aeroplanes is that it requires high volumes and weight – typically needing a lot more space than a conventional petrol tank to operate successfully. If the hydrogen is stored as a liquid, it needs to be cooled down cryogenically, which uses up large amounts of energy.

Duncan Gregory, Professor of Inorganic Materials in the School of Chemistry, is working with Hydrogen Horizons, a small company considering locating in Glasgow, which has designed a patented tank called the Hydrisafe tank for storing hydrogen in the solid state. This new technology should be faster to refuel and much safer than other alternatives.

Another obstacle holding back the large scale use of hydrogen as a fuel has been that getting the hydrogen in and out of a solid to refuel or supply the fuel cell respectively has been extremely slow. In previous research under the Engineering and Physical Science Research Council (EPSRC) SUPERGEN initiative – as part of the UK Sustainable Hydrogen Energy Consortium – Prof Gregory first examined nanostructured lithium nitrides that can release hydrogen four times faster than equivalent bulk materials.

In the first stage of the current research, which is being funded by a Knowledge Transfer Account award provided by the



Unmanned Aerial Vehicle where the technology will be demonstrated.

EPSRC, Prof Gregory is working with the company to examine whether employing nanoparticles or nanowires in the tank will greatly speed up the time it takes to get the hydrogen in and out of the system.

If the technology proves to work successfully, Prof Gregory will look at whether using other nanostructured alloys can further speed up the transfer of hydrogen in and out of the tanks.

“If, after the KTA funded project ends, the implications are that we have a system that works, we can think about using this in different scenarios such as flight, road transport, cooling, refrigeration or even heating and powering buildings, which would represent a paradigm shift in our use of energy,” said Prof Gregory.

Prof Gregory has also submitted a proposal for EU funding to work with a number of international partners including EADS Innovation Works and Cassidian Air Systems (an EADS company) to develop within three years a small unmanned aircraft that is powered by hydrogen and fuel cells. If this is successful, the technology could be scaled up for bigger applications such as larger planes and cars.

“EADS and other manufacturers are extremely interested in this technology because they need to drastically reduce the carbon footprint of their aeroplanes, and in the long term anyway, carbon fuels for engines will have to be replaced” he said.

Dr Freddy Ornath, CEO of Hydrogen Horizons, said: “The collaboration between Hydrogen Horizons, Glasgow University and EADS is a fine example of collaboration between academia and industry that could revolutionize/accelerate the pace of hydrogen adoption by providing efficient and safe hydrogen storage.”

“Hydrogen storage is the key for many companies across a range of sectors, using carbon based fuels to switch to a new sustainable fuel.”

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