

# Hydrogen sponges at home, at work, at play

Solid-state metal hydrides (“hydrogen sponges”) represent the safest and most volume efficient way of storing hydrogen. They have been studied at Geneva University for over 30 years with respect to fundamental aspects such as synthesis and properties of new materials, and practical aspects such as integration into practical devices like hydrogen storage vessels for hydrogen engines, fuel cell systems and home applications.

Notable achievements during the past years include the discovery of a wide variety of so-called “complex” transition metal hydrides of which many are capable of storing hydrogen in concentrations exceeding that of liquid hydrogen. In a quest to put these sponges to practical use the following hydrogen powered devices have been designed for home, for work, and for play.



Klaus Yvon

## Hydrogen-powered lawn mower

Geneva has developed the world wide first hydrogen powered lawn mower containing hydrogen sponges as a storage medium.

It was adapted from a commercial model running on gasoline and is one of the rare hydrogen powered devices still operational after 17 years of successful and uninterrupted use [1].



**Fig. 1:** Hydrogen powered lawn mower after 16 years of operation. Hydrogen sponges are situated in the cylindrical container.



### Hydrogen-powered barbecue

A commercial barbecue has been adapted by replacing the propane burner by a series of hydrogen burners connected to hydrogen sponges.

A panel of evaluators confirmed that the taste of hydrogen roasted meat was undistinguishable from that of propane roasted meat.



### References

- [1] K. Yvon and J.-L. Lorenzoni, "Hydrogen Powered Lawn Mower: 14 Years of Operation". *Int. J. Hydrogen Energy*, 31, 1763-1767 (2006).
- [2] P. Hollmuller, J.-M. Joubert, B. Lachal and K. Yvon. "Evaluation of a 5 kWp Photovoltaic Hydrogen Production and Storage Installation for a Residential Home in Switzerland" *Int. J. Hydrogen Energy*, 25, 97-109 (2000).

### Pop music by hydrogen

Powering a music scene represents a challenge for fuel cell systems because of the rapidly varying time structure in energy demand of the various components (amplifier, light sources etc). In order to study the response to such solicitations the worldwide first TÜF certified fuel cell system (2 kW) was successfully tested under real conditions during the festivities of the 450th anniversary of Geneva University (Nuit de l'Université, 13 June 2009).



**Fig. 3:** Hydrogen powered fuel cell (left) powering music scene with singer Aliose (right) during the festivities of the 450th Anniversary of Geneva University in 2009.



**Fig. 2:** Concentric hydrogen burners (top) and open barbecue in use (down).

### Solar hydrogen house

Having evaluated a photovoltaic hydrogen production and storage installation in a residential home in Switzerland some 9 years ago<sup>2</sup>, scientists at Geneva University currently are assembling an updated installation for solar hydrogen production, storage and utilization (stove, lawn mower, fuel cell electricity generation), by using the latest technologies available, including the use of hydrogen sponges. Altogether, these applications aim at paving the road towards the introduction of hydrogen as a renewable energy vector in every day's life.

### Contact

Professor Dr. Klaus Yvon  
MANEP, Université de Genève  
24 Quai Ernest Ansermet  
CH-1211 Genève 4, Switzerland

Phone: +41 22 379 6231  
Fax: +41 22 379 6906  
email: klausyvon@unige.ch

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