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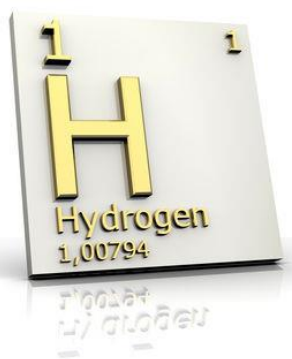
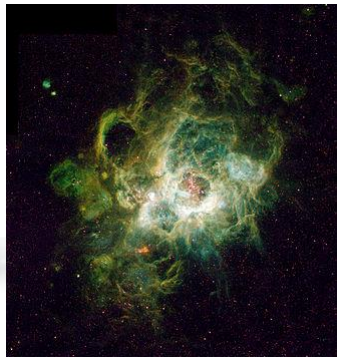
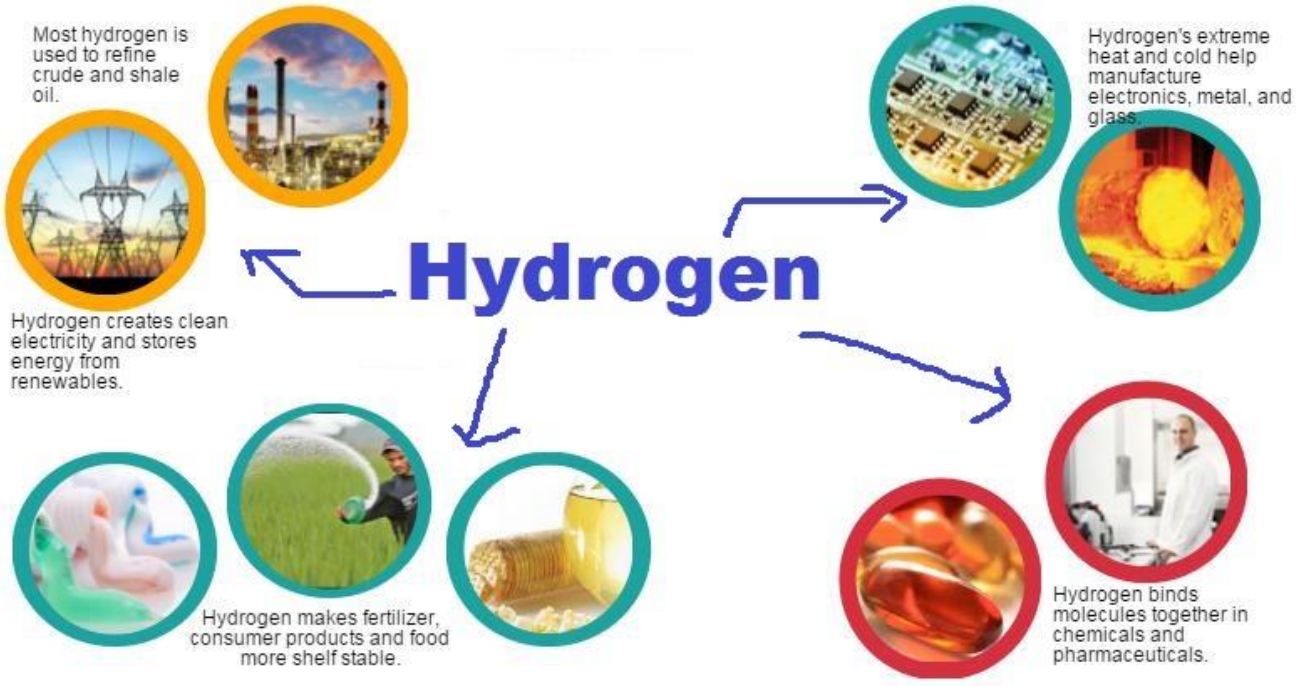




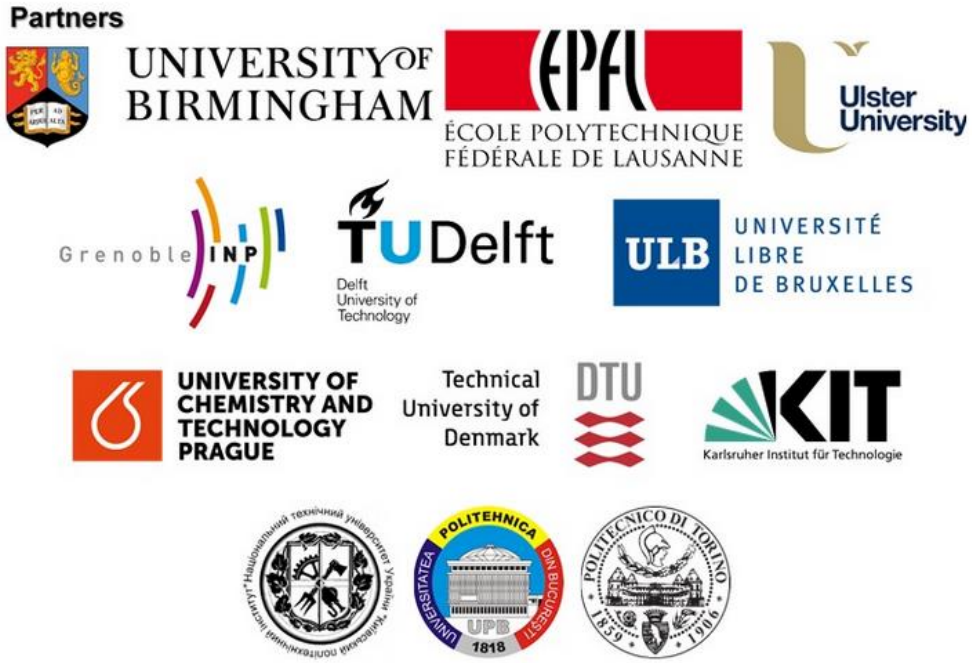
Hydrogen & fuel cells

Hydrogen, as atomic H, is the **most abundant chemical element** in the Universe, making up 75% of normal matter by mass and more than 90% by number of atoms.



The utilizations of hydrogen

TeacHy - Teaching Fuel Cell and Hydrogen Science and Engineering Across Europe within Horizon 2020.



TeacHy is a project funded by the Horizon 2020 program through FCH JU.

The offers its network partners access to its educational material and the use of the MSc course modules available on the TeacHy web site.

There are 12 partners from 11 European countries. Until this moment the partners contributed together to the realization of 20 didactical modules.

The TeacHy project is a Coordination and Support Action funded by the European Union's H2020 programme through the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement no. 779730. Any opinions expressed on these web pages are solely those of the authors and neither of the FCH 2 JU, nor the European Commission or its representatives.

Hydrogen History

- 1671 - Robert Boyle dissolved iron fillings in dilute hydrochloric acid and reported that the 'fumes' given off were highly flammable.
- 1766 - Discovered and isolated by Henry Cavendish in 1766. 1781- H_2+O_2+ ED $\rightarrow H_2O$
- 1781 – Named Hydrogen by Antoine Lavoisier.
- 1789- van Troostwijk & Deiman-Electrolysis of water-
- 1898 - James Dewar produced the first liquid hydrogen.
- 1900 - the first 'Zeppelin =Airship' made its flight filled with hydrogen.
- 1909-The pH scale by P. L. Sørensen
- 1923-J. N. Brønsted defined an acid as a proton donor.
- 1931 - Harold Urey discovered deuterium.
- 1947-$LiAlH_4$ prepared by H. I. Schlesinger-Chicago University
- 1954-Detonation of H-Bomb on Bikini Atoll
- 1960's Super acid (BF_3-HF)G. A. Olah.. Nobel 1994
- 1978- H. C. Brown Nobel Prize, Purdue University, Hydroboration
- 1984-First Stable T.M. dihydrogen compound discoved by G. Kubas
- 1996 - Metallic hydrogen was prepared

Henry Cavendish (1731-1810)

Hindenburg 1937

H-Bomb 1952

1900-1930's German war machine

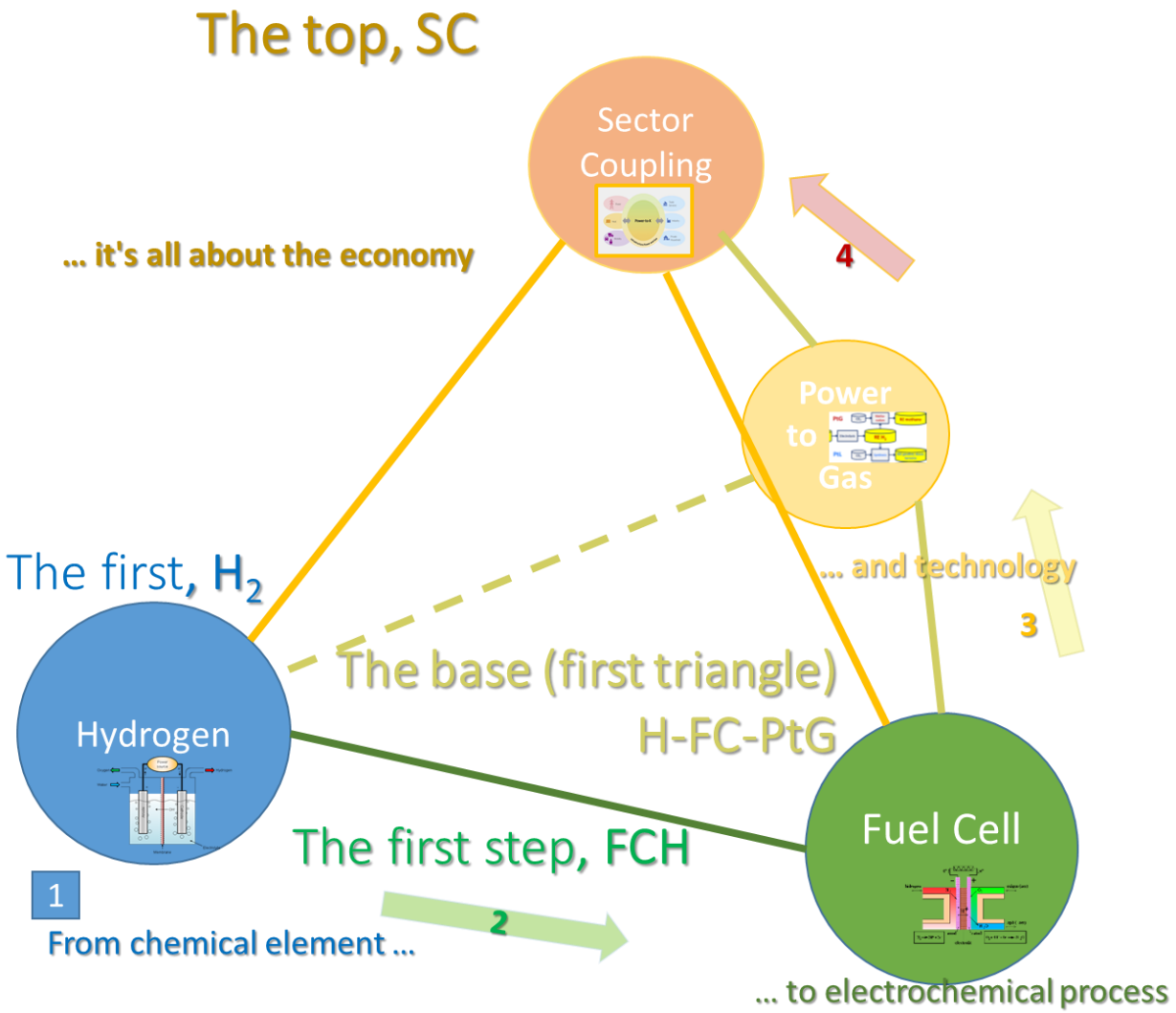
1891 water splitting
Poul la Cour -Danish

The hydrogen pyramid

1. The first corner H_2,
2. The first step/line FCH
3. The base (first triangle)
   H-FC-PtG
4. The top (complete pyramid)
   H -FC-PtG-SC

Without hydrogen nothing starts, without fuel cell there is no first step, and to have SC you need the base, top (SC) in fact can only be achieved by the successive and evolutionary development of the base points.

The side triangles are theoretical and unfeasible practically without hydrogen or another fuel



National Research and Development Institute for Cryogenic and Isotopic Technologies – ICSI Rm. Valcea

ICSI Rm. Valcea is a scientific research and technological development unit.

ICSI Rm. Valcea was founded in 1970 under the name of “G Plant” Rm. Valcea, as an industrial pilot plant.

Among the main components of ICSI’s mission, the following can be mentioned:

- supporting the nuclear energy through Research-Development and Innovation activities,
- development and implementation of hydrogen-based technologies and sources of renewable energies,
- study of topics related to environmental protection and food security.

Thank you for attention!

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