

"Green Hydrogen and its possible next adoption at CENAM to define the traceability and value chain of the technologies related to this fuel in Mexico"

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ABSTRACT

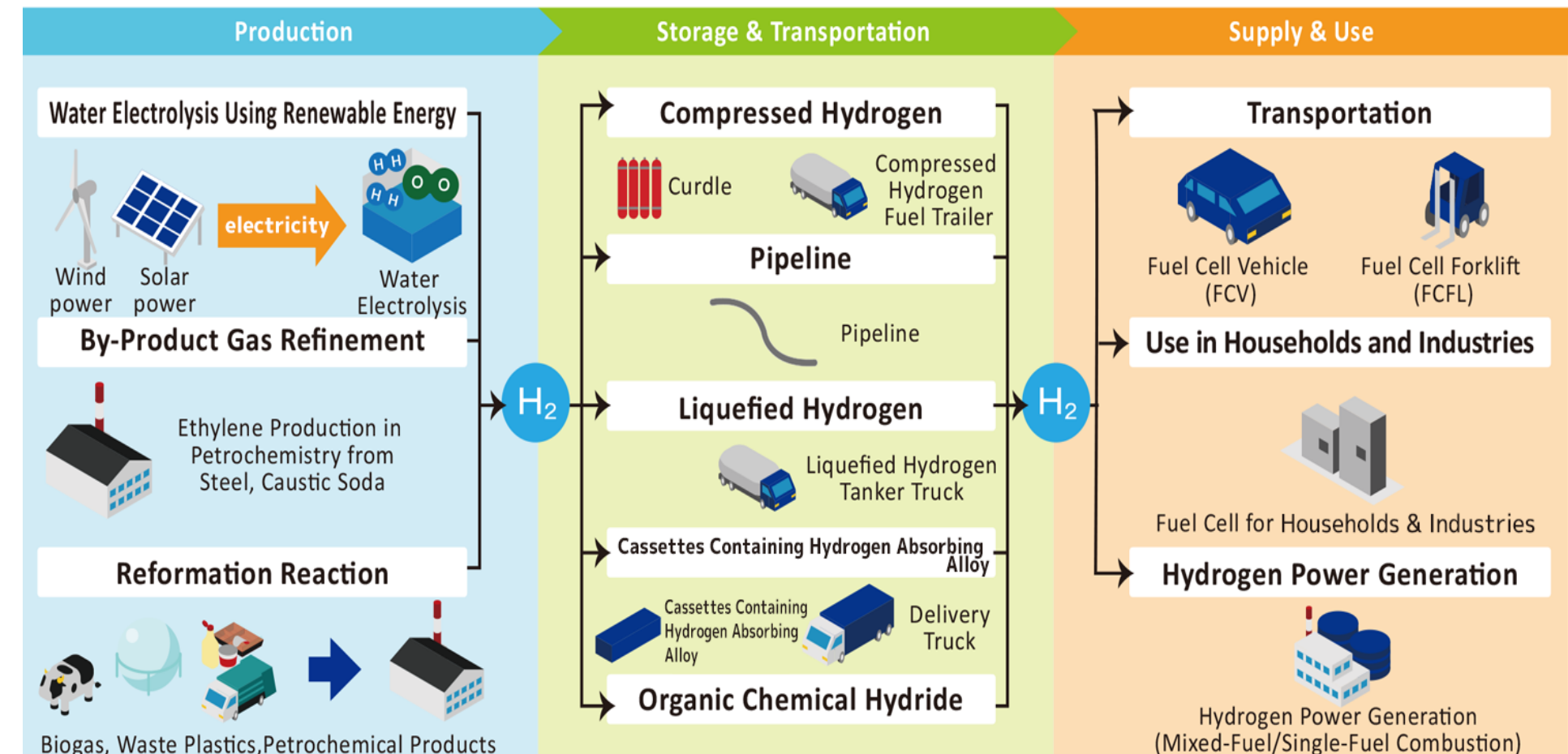
In this work, I propose the creation of the "Metrological Laboratory of Hydrogen Technologies" to perform the design, development and implementation of the "National Reference System for the Evaluation of the Performance of PEM-type fuel cells and electrolyzers", to provide certainty and traceability to the measurements and different applications with these devices. This project has already made significant progress regarding development of new electrocatalytic nanomaterials (different to platinum) that have been used as electrodes (anodes/cathodes) in hydrogen fuel cells, which maintain adequate power levels even when the fuel used is grey hydrogen, achieving an important reduction in cost of these devices.

GENERAL HYDROGEN CLASIFICATION

Grey Hydrogen	Blue Hydrogen	Green Hydrogen	Black Hydrogen	Pink Hydrogen	Turquoise Hydrogen	Yellow Hydrogen
Process: Steam Reforming	Process: Steam Reforming With Carbon Capture	Process: Electrolysis	Process: Gasification	Process: Electrolysis	Process: Pyrolysis	Process: Electrolysis
Source: Natural Gas	Source: Natural Gas	Source: Renewable Energies	Source: Coal	Source: Nuclear Energy	Source: Natural Gas	Source: Solar Energy

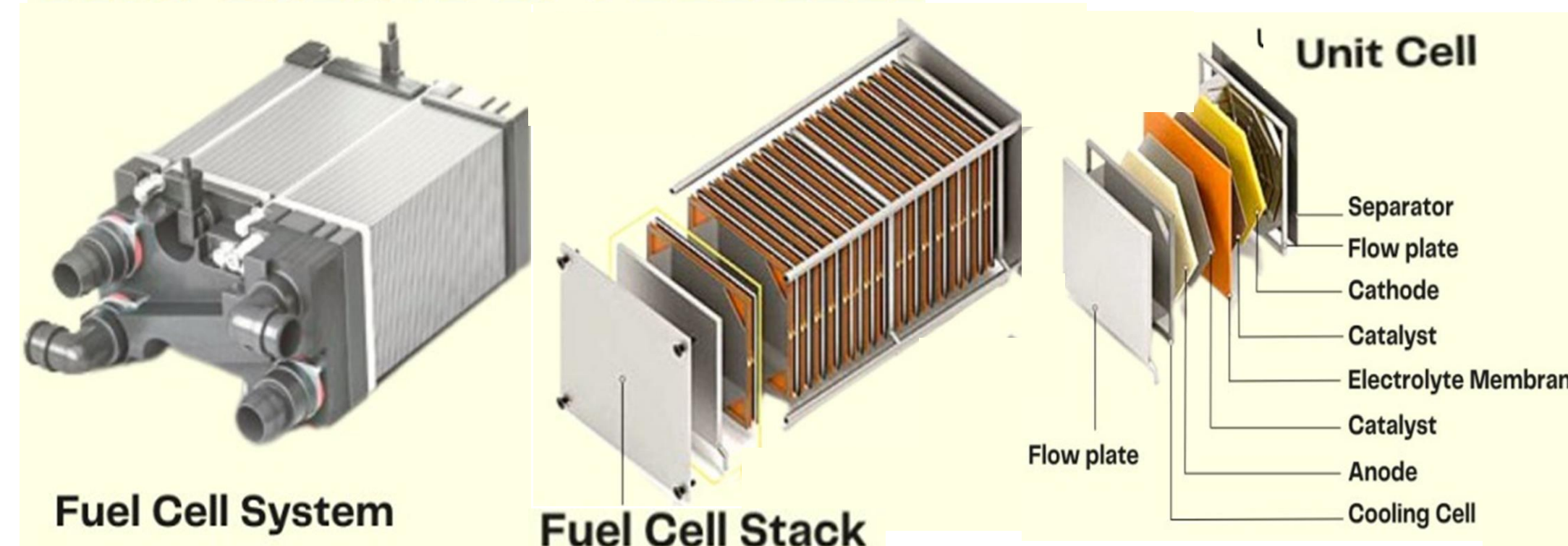
<https://www.accionia.com.au/updates/stories/what-are-the-colours-of-hydrogen-and-what-do-they-mean/>

GENERAL HYDROGEN VALUE CHAIN



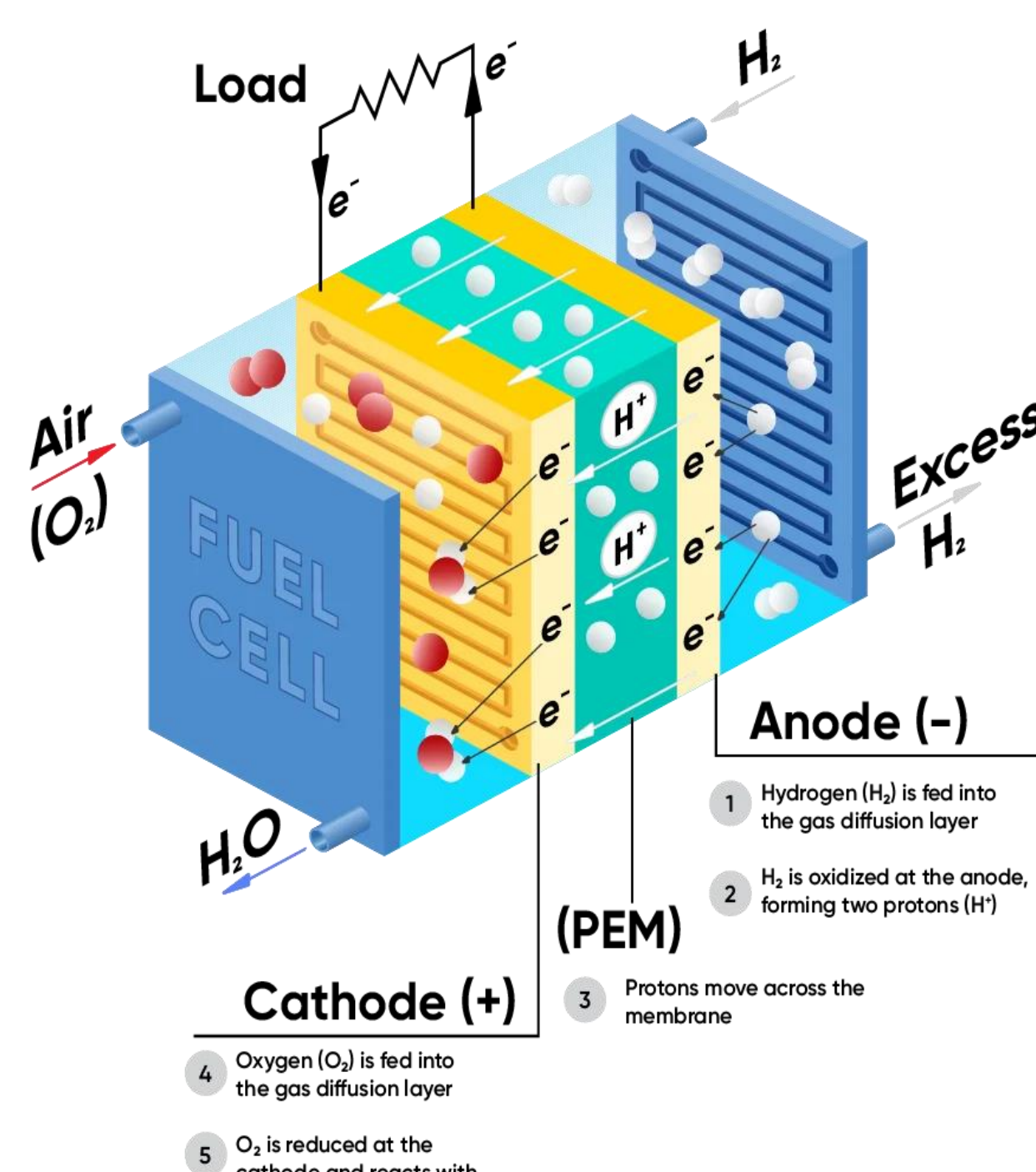
https://www.env.go.jp/seisaku/list/ondanka_saisei/lowcarbon-h2-sc/en/demonstration-business/index.html

COMPONENTS OF FUEL CELL



<https://www.linkedin.com/pulse/hydrogen-fuel-basics-different-types-cell-electric-vehicle-tharad-kazvc>

Schematic of a fuel cell



<https://www.biologic.net/topics/what-are-pem-fuel-cells-and-electrolyzers/>

Schematic of an electrolyzer

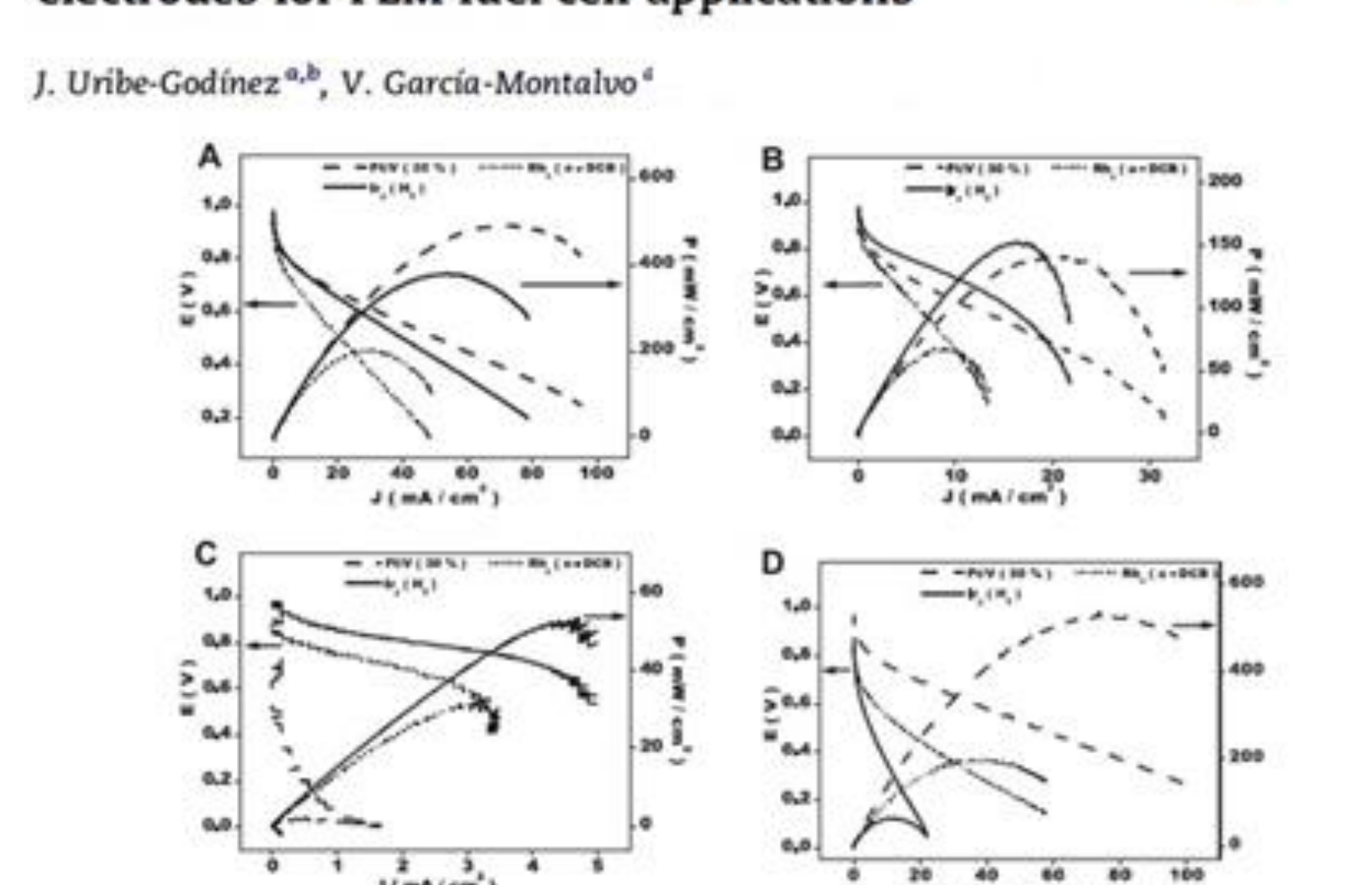
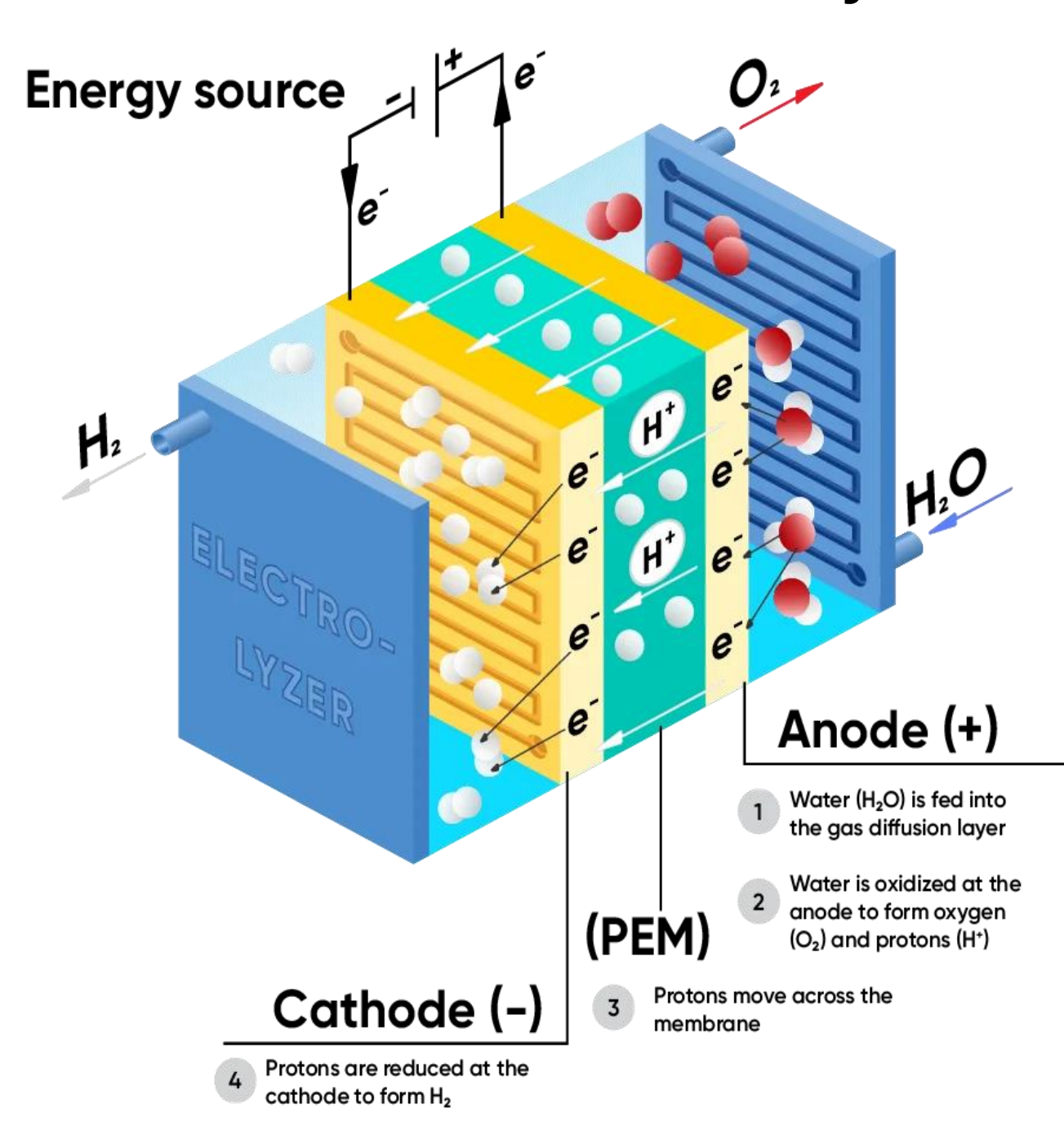
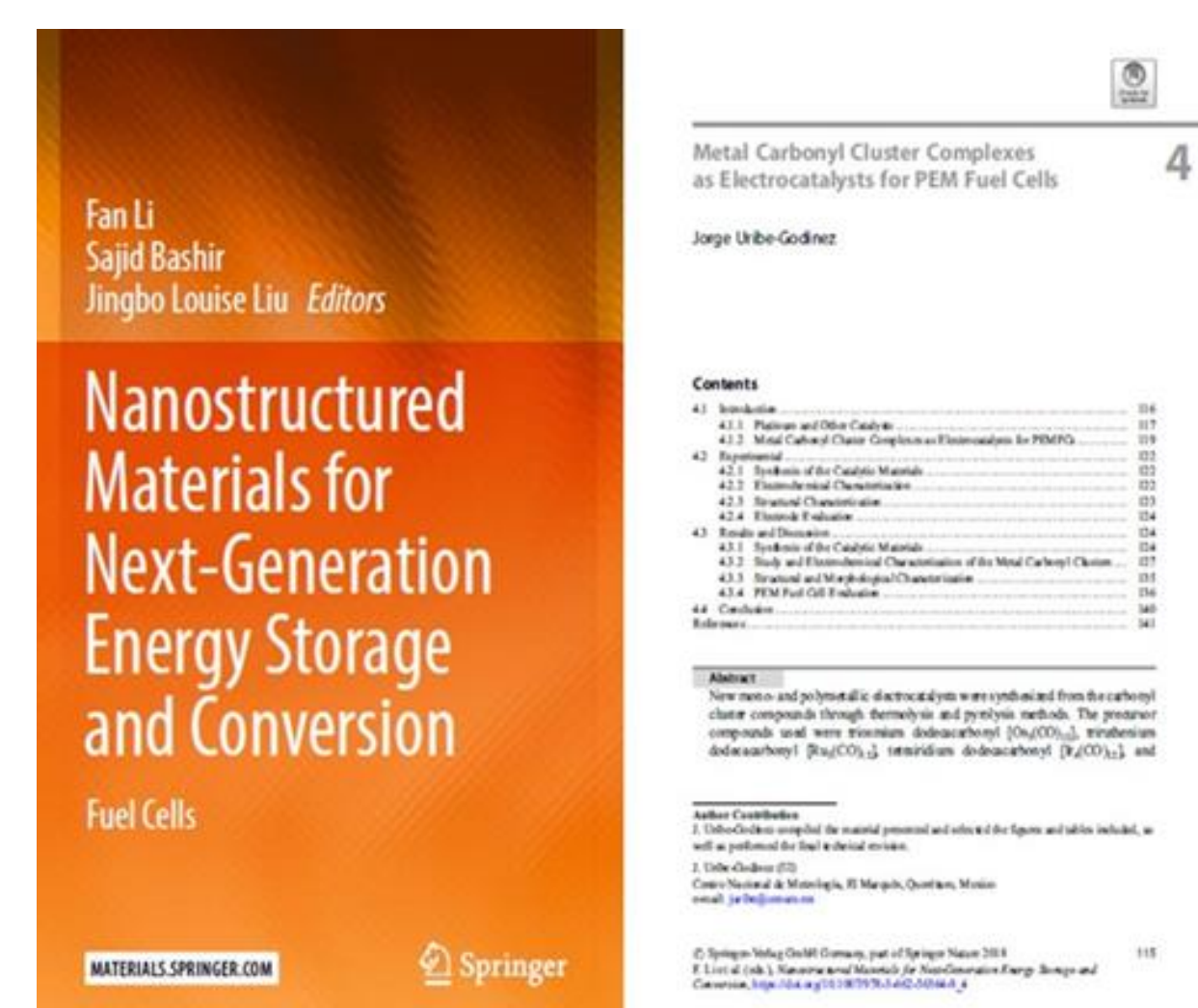


Fig. 3 - Performance of Ir, Rh, and Rh-D-Cr as anodes in a hydrogen fuel cell at room temperature: A) in the absence of CO; B) in the presence of 100 ppm CO; C) in the presence of 0.5% CO; D) Performance of Ir, Rh, and Rh-D-Cr as cathodes. A comparison with Pt electrodes was included in all cases.



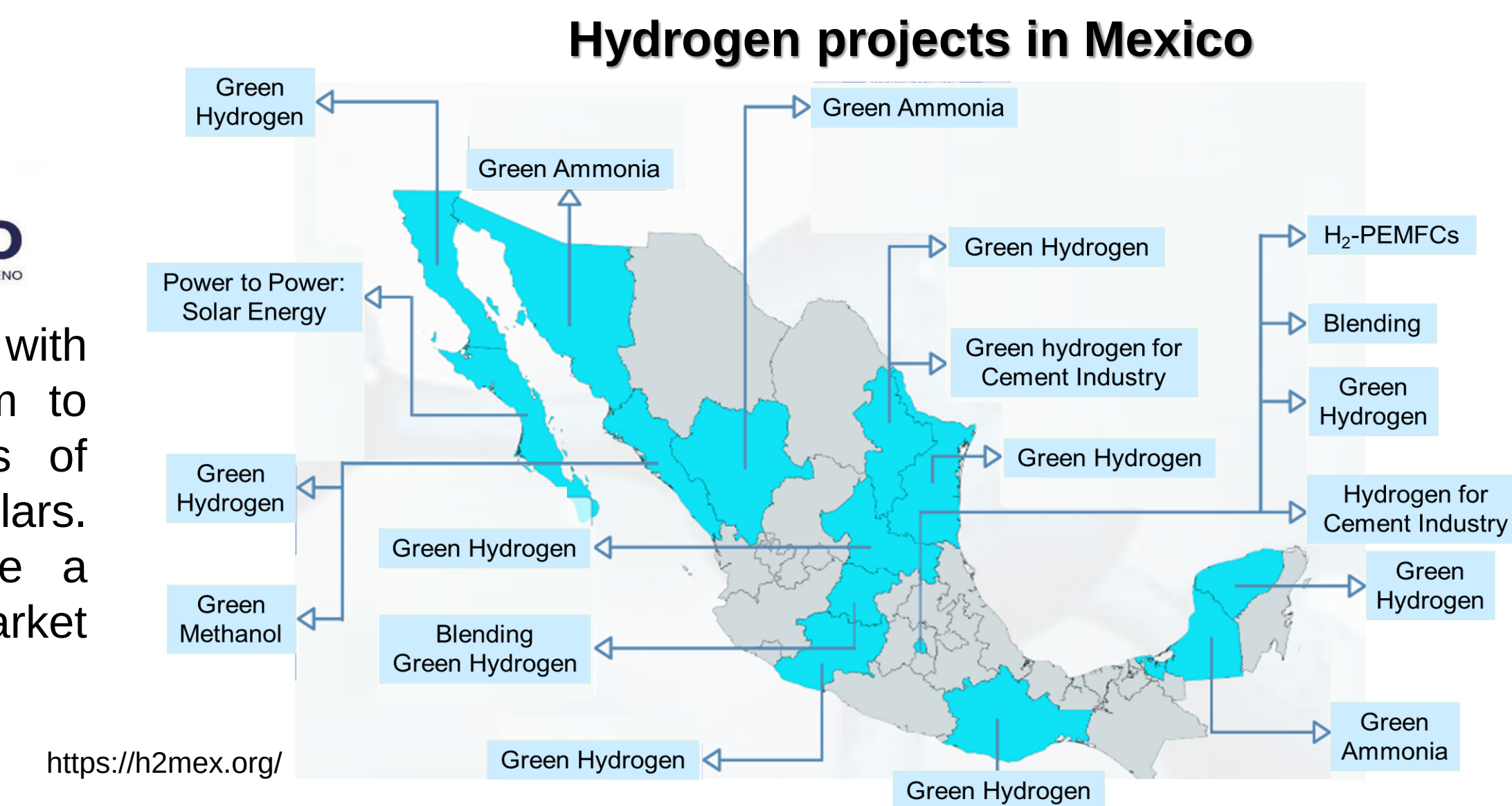
Current situation of hydrogen in Mexico

In Mexico, 98.6% of hydrogen is captive (self-consumption in industrial plants), and only 1.4% is commercial.

Some specific regions of countries such as, Mexico could achieve hydrogen costs as low as 1.2 USD/kg.

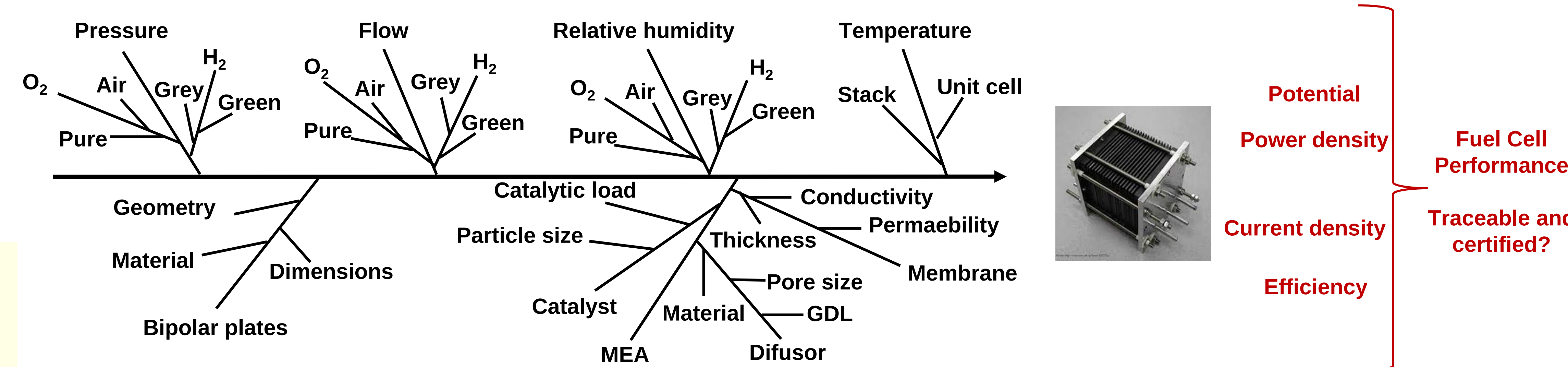


AMH₂ will work with President Sheinbaum to promote investments of 60,000 million dollars. Challenge: to create a regional hydrogen market in North America

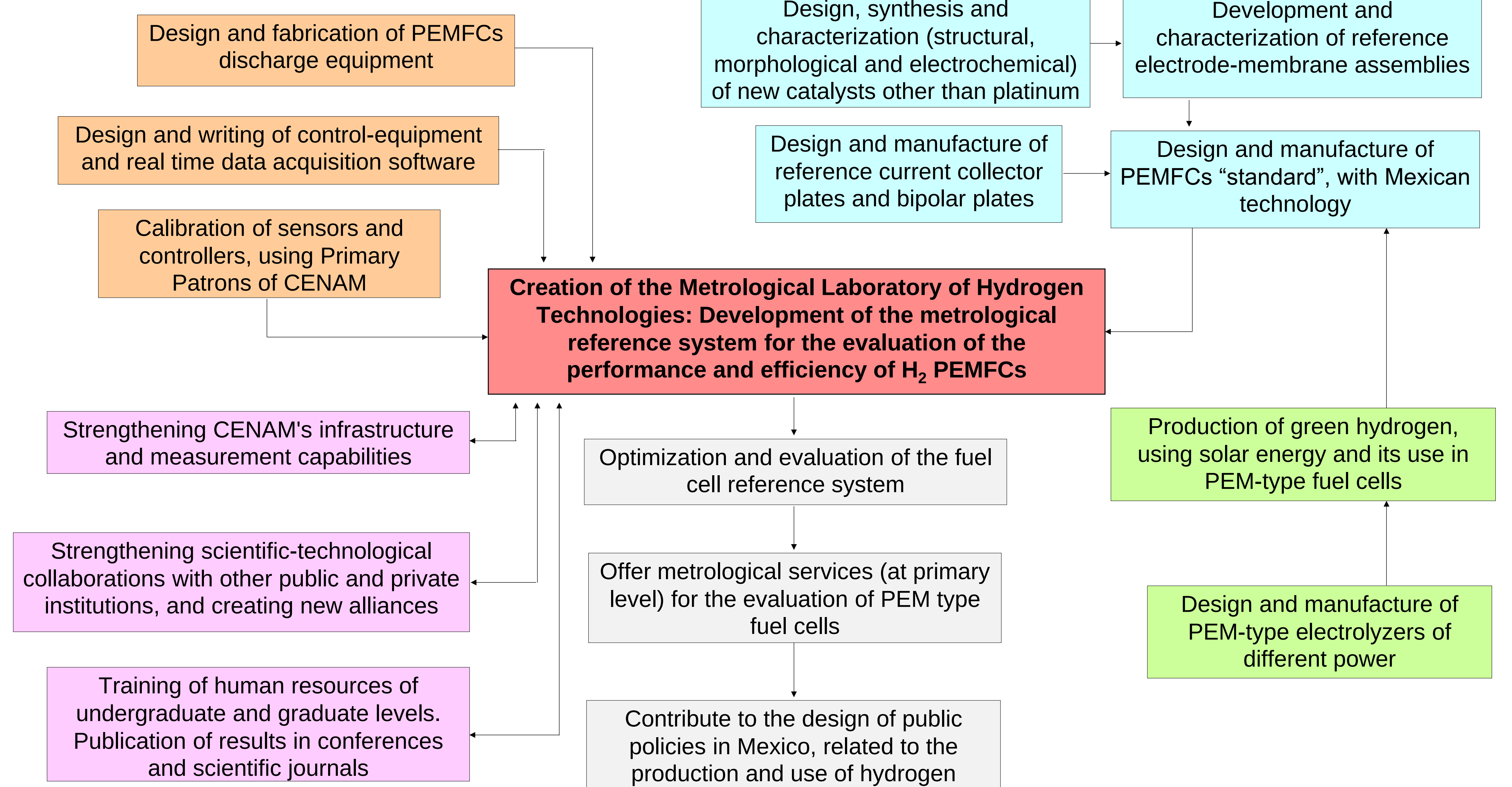


<https://h2mex.org/>

ISHIKAWA DIAGRAM



PROJECT



CONCLUSIONS

This proposal contemplates the implementation of a reference metrological system for the evaluation of performance of hydrogen fuel cells and, in a second stage, of PEM-type electrolyzers, which will allow us establish the traceability chain and reliability of the measurements realized with these kind of devices and for the technologies related with hydrogen such as, the certification of this fuel produced by water electrolysis using renewable energies. The project will contribute with the proposal of public policies, use of standards and metrological methodologies related to production and uses of hydrogen in México. In addition, the project includes basic research corresponding to the design, synthesis and characterization of new and less expensive catalytic materials, up to applied research, using these catalysts directly in PEMFCs and electrolyzers (also designed and fabricated with Mexican technology) in order to bringing hydrogen technologies closer to the Mexican population, but in a social and more economical way, contributing in turn to reducing two of the fundamental problems in Mexico: growing demand for energy and environmental pollution.

REFERENCES

- HINICIO, Green Hydrogen in Mexico, Eds. William Jensen Díaz, et al., Ed. GIZ, Bonn, Germany, 2021.
- J. Uribe-Godínez, Ch. 4 in Nanostructured Materials for Next-Generation Energy Storage and Conversion, Liu, J. L. et al., Springer-Nature, Germany, 2018.
- J. Uribe-Godínez et al., Ch. 6 in "Advances in Sustainable Energy". Eds: Gao, Yj., Song, W., Liu, J.L., Bashir, S., Editorial: Springer-Nature. Alemania, 2022.