Harvestore and *Epistore* projects: bridging materials and silicon technologies for micro-energy or portable energy applications

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Abstract

Havestore (GA 824072) [1] and Epistore (GA 101017709) [2] are two EU projects, funded in the FET (Future Emerging Technologies) program, which are coordinated by IREC and where IMB-CNM (CSIC) plays a significant technological role. The full name of Harvestore is *Energy HarveStorers for Powering the Internet of Things*, and the one of Epistore is *Thin Film Reversible Solid Oxide Cells for Ultracompact Electrical Energy Storage*. As it can be appreciated, both projects deal with topics encased in what has been broadly designated as Smart Energy.
In the first case, microdevices able to harvest and store small amounts of power coming from environmental heat and light sources are researched. The goal is to supply the energy autonomy that distributed sensing requires in IoT scenarios without resourcing to primary batteries, whose replacement and disposal will be logistically and environmentally unsustainable. Concepts such as thermogalvanic microbatteries, ion-gated thermoelectric devices coupled to thin film batteries, and high-T PV cells coupled to solid oxide cells are considered.
In the second, thin film reversible solid oxide cells are targeted as a solution for seasonal energy storage in scenarios of portable energy ranging up to 1 kW with a pocket size device. Reversible refers to the combination in the same device of the fuel cell and electrolyser modes, enabling Power to Power and Power to Gas schemes using hydrogen as a vector.
Some common features in both cases are (1) the use of thin films to find solutions with ultralow contents of critical raw materials, (2) the exploitation of nanoscale concepts, and (3) the merging of the developed functional materials with silicon technologies so that devices enabling proper interaction with the environment can be miniaturized and produced in large numbers in a cost-effective way.

REFERENCES

[1] https://harvestore.eu/
[2] https://harvestore.eu/

FIGURES

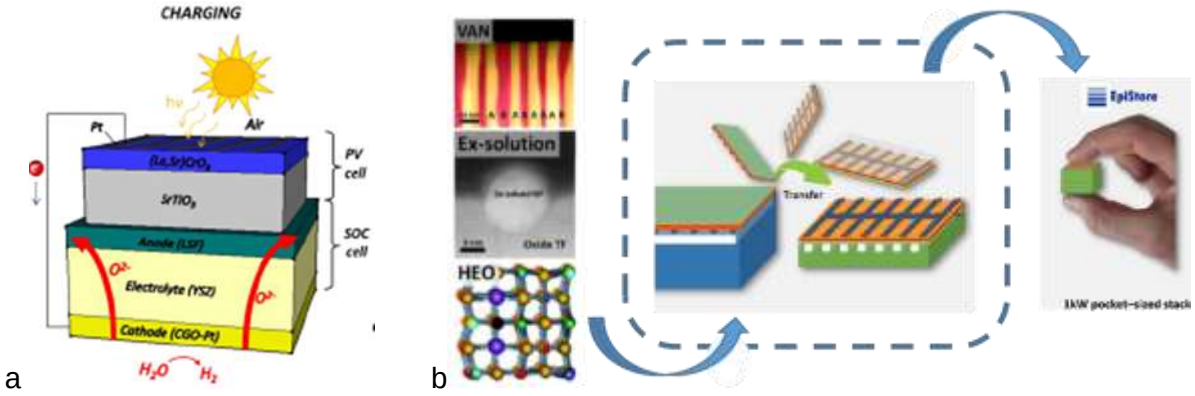

Figure 1: (a) one of the Harvestore concepts: an all-solid-oxide PV cell coupled to a reversible solid oxide cell. (b) Epistore concept where a thin film anode-electrolyte-cathode stack is integrated on a silicon skin which can be later on transfer to a machined metal substrate and piled-up for energy/power scalability.