

**Production and Storage of hydrogen: Modeling and Simulation**

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Abstract:

Hydrogen has a high calorific value, very abundant on earth and clean. Its combustion does not produce greenhouse gases, so it is a good candidate to replace fossil fuels. However, its production and storage are still a problem, especially since this production must be clean without greenhouse gases. Thus, for hydrogen to be a clean energy vector, it must be produced from renewable energies by processes that do not release greenhouse gases.

These processes include: - electrolysis by photovoltaic, by thermal solar concentrating (CSP) and by wind turbine - Thermolysis and thermochemistry by concentrated solar energy - or photo-electrolysis by photovoltaic and solar thermal with concentration,

Renewable, clean and sustainable energy represents a serious alternative to fossil resources, whose global reserves are declining and have a negative impact on the environment causing global warming.

However, in addition to the fact that the cost of renewable energies remains high compared to fossil fuels, some renewable energies such as solar and wind are suffering from the intermittent problem.

To remedy this problem, a great deal of attention has been paid to ways of storing energy efficiently.

Thus, scientific research has focused on the development of batteries and in particular lithium ion batteries. The energy storage in hydrogen is an area that has received a lot of interest from researchers, this is a promising area. Hydrogen is considered a good energy carrier. Hydrogen which is cleanly produced must be stored efficiently, with good gravimetric and volumetric storage capacity, good kinetic, and thermodynamic. That is, a lightweight and small tank that fills and empties quickly, and operates at normal temperatures and pressures.

This tank must have superior performance compared to tanks currently used at high pressure (storage under compression), too expensive (storage by cryogenics) in addition to leakage problems.

The search for such a tank is an intense scientific research activity in the field of hydrides in various forms; covalent, metallic and complex and different dimensions; bulk, thin layers, nanowires and nanotubes, and nanoparticles.

Contribution: Invited