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Elaboration and characterization of $\text{CuInGa}(\text{S},\text{Se})_2$ Chalcopyrite and APbX_3 metal halide perovskite semiconductors for Photovoltaic Applications.

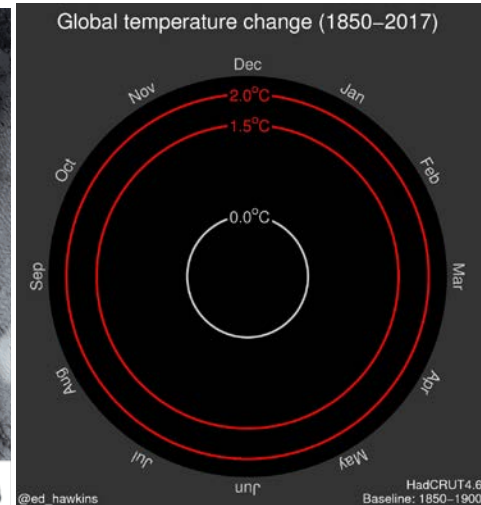
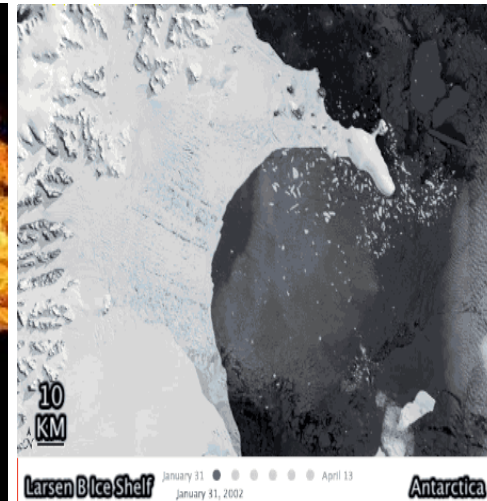
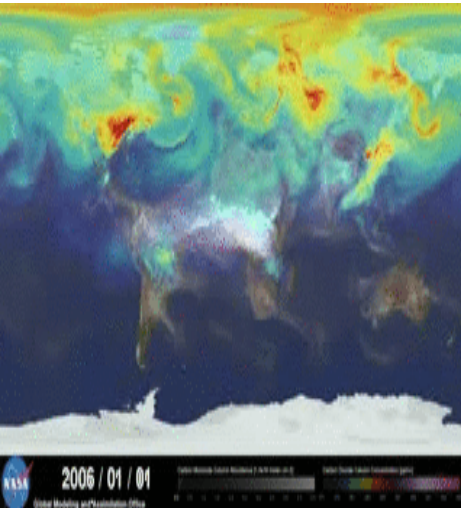
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Introduction

Climate change: Alarming data



Solutions for the future energy :

Photovoltaic or Solar energy:

Conversion of sunlight into electrical energy by semiconductor materials.

control the water and you control everything

control the energy and you control everything

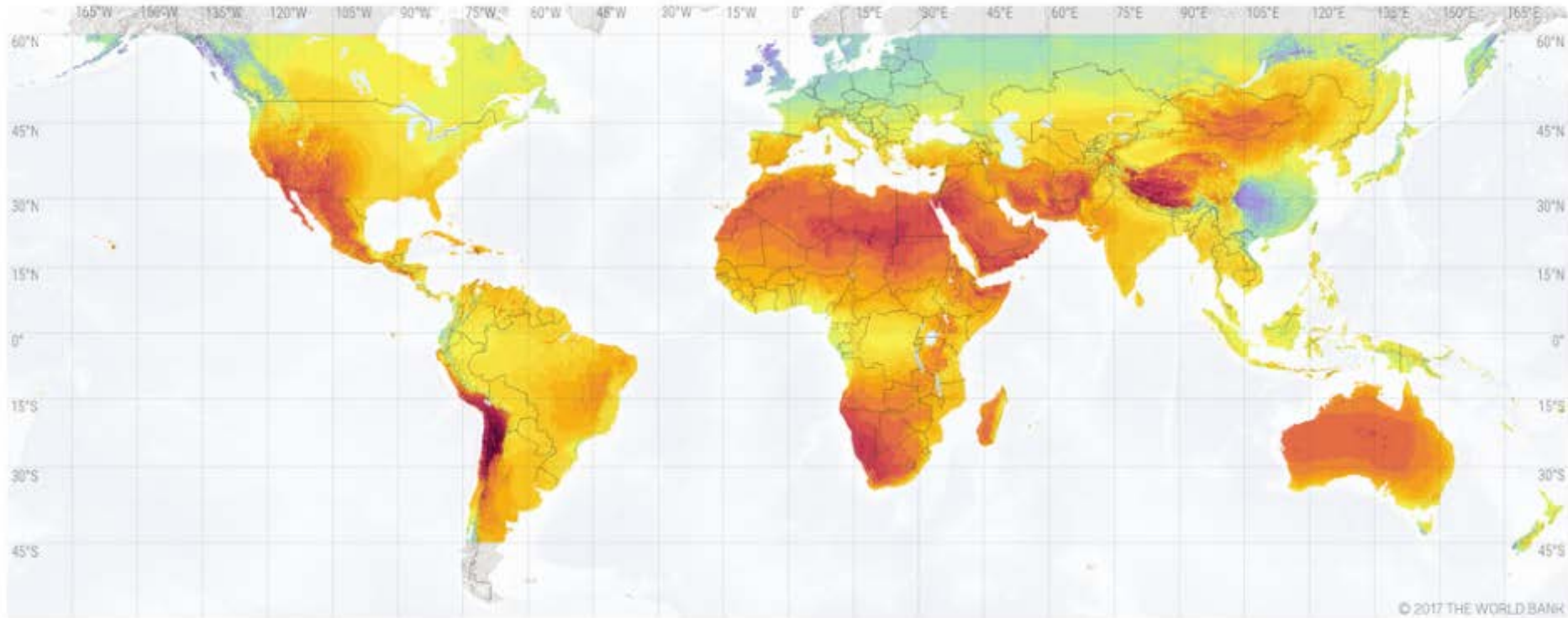




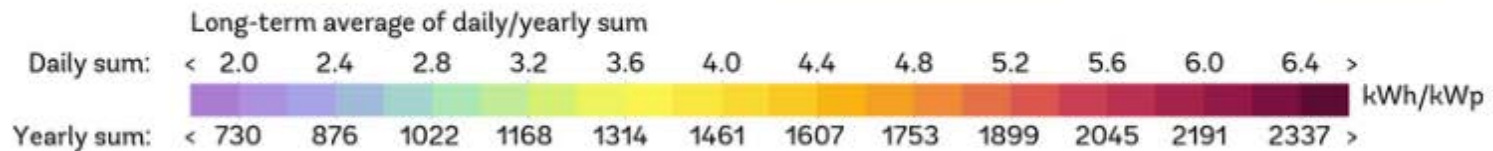
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Introduction

SOLAR RESOURCE MAP PHOTOVOLTAIC POWER POTENTIAL



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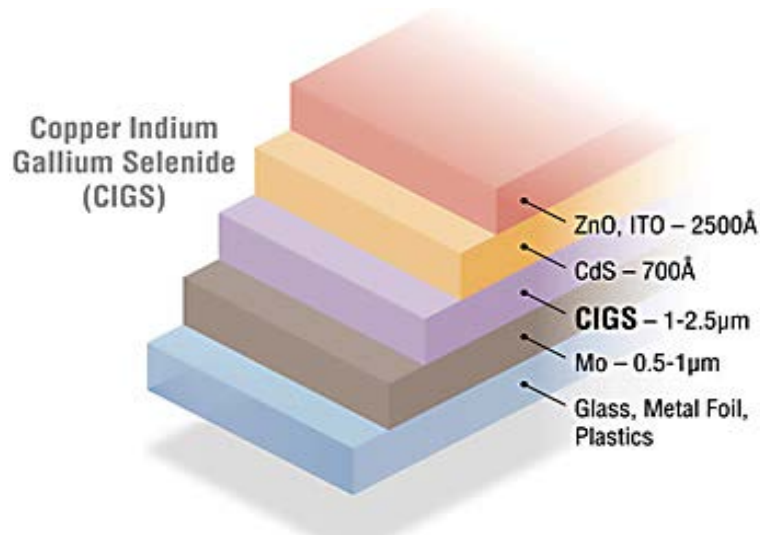


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Introduction

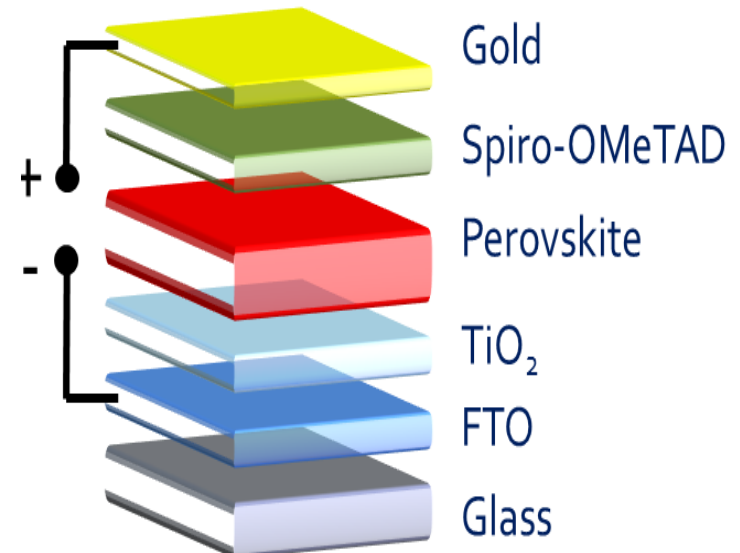
CIGS Solar Cells:

- High absorption coefficient ($\sim 10^5 \text{ cm}^{-1}$).
- Excellent radiation resistance.
- Direct band gap (1.5 eV).
- High performance thin films solar cells (23.6%).



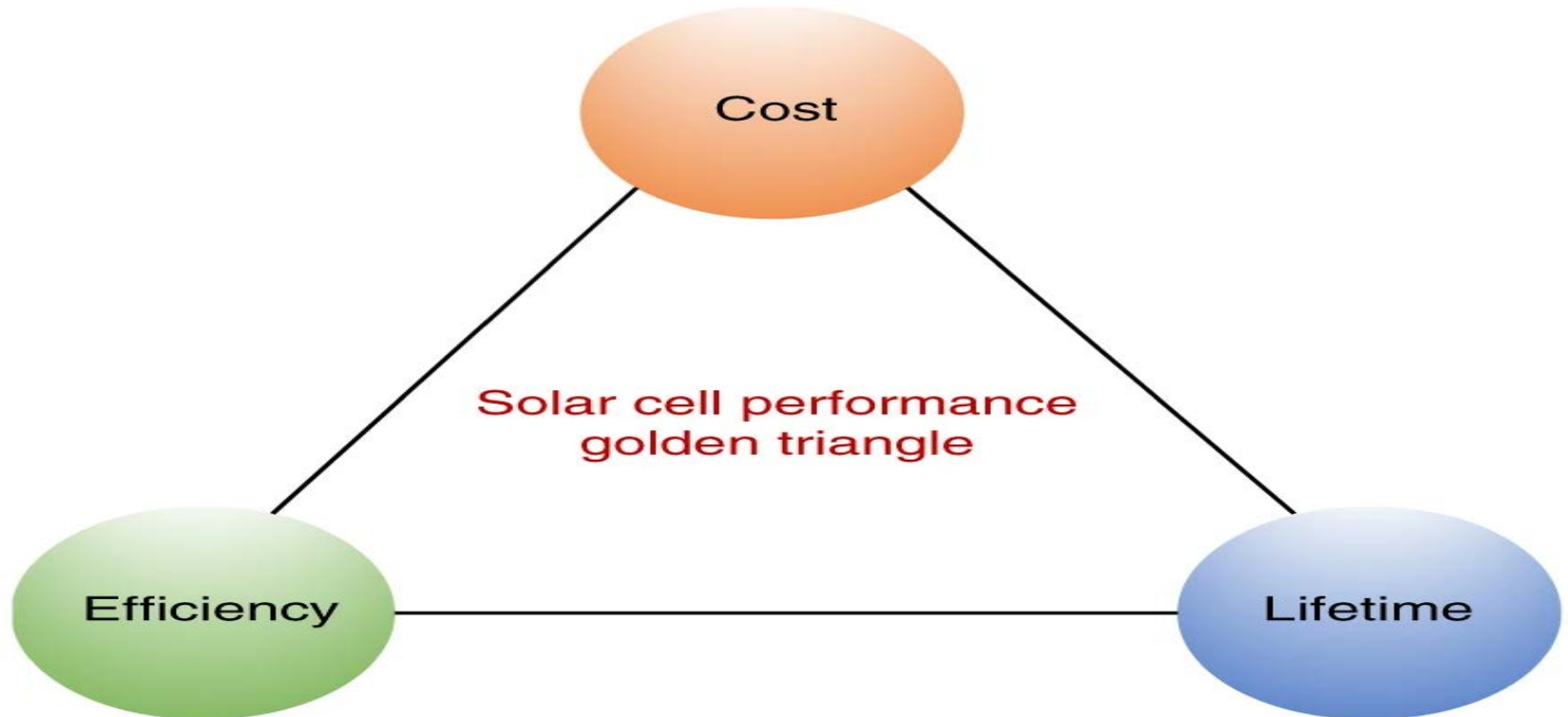
Perovskites Solar Cells:

- Cheaper, high efficiencies.
- Good absorption coefficient.
- Excellent optical properties.
- Energy conversion efficiency up to 20.1%.

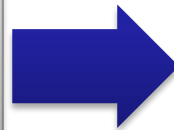




Research Objectives



Deposition of **CIS, CIGS**
and **APbX₃** thin films
using low cost Methods.



Improvement of
photovoltaic efficiency



Comparative results with
powerful techniques and
Realization of solar cells.



Main stages of research development

First Stage

State of the art :

CIS, CIGS chalcopyrite,
APbX₃ perovskites

Elaboration:

Low cost techniques

Characterization:

XRD, SEM, TEM, XPS,
AFM...

Second Stage

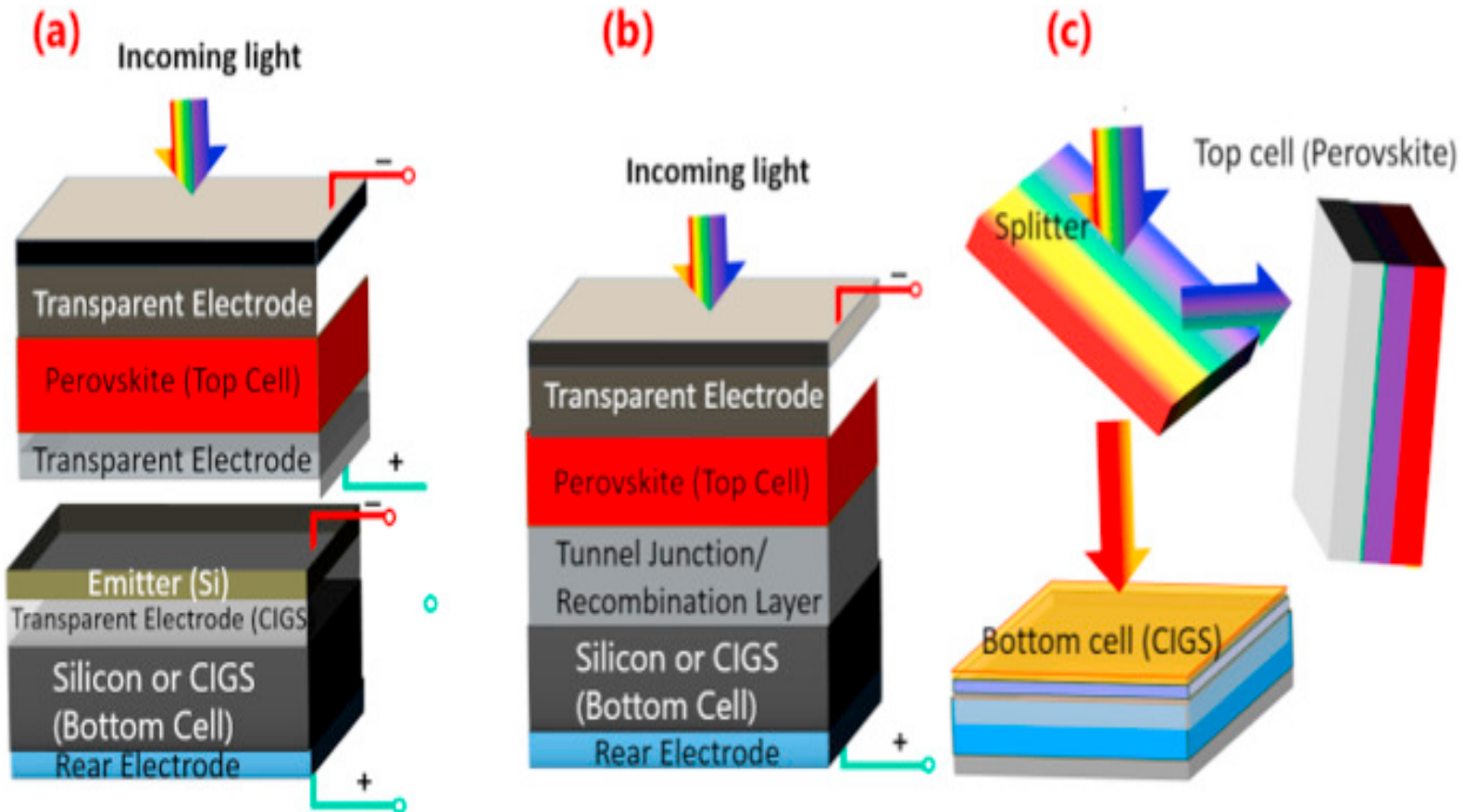
- Modeling the physicochemical properties of materials by using **ID SCAP Software**.
- Comparative study of the obtained results by **Numerical simulation** and **experimentally** implementation of thin films optimization in the manufacturing process.

Third Stage

- Optical, electrical and optoelectronic characterization of semiconductor thin films.
- The current-voltage **I (V) characteristic** under illumination by solar simulator.

Expected results and possible benefits

A tandem perovskite/CIGS solar cell has the potential for high conversion efficiency exceeding single junction solar cell performance.





Expected results and possible benefits

Technological

This research project will contribute to the growth of technologies using new sources of renewable energy

Environmental

Solar photovoltaic are now at the heart of our country's R & D programs as much as government bodies, agencies and industry in our country as many other countries.

Economical

Today, the industrial production of electricity comes mainly from natural gas reforming (95% of global production) and, less frequently, more energy-intensive electricity generation methods such as solar panels.



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Conclusion

Solar power is an immense source of directly useable energy for future.



