CdSe Solar Cell Fabrication

Project Plan

sddec24-21
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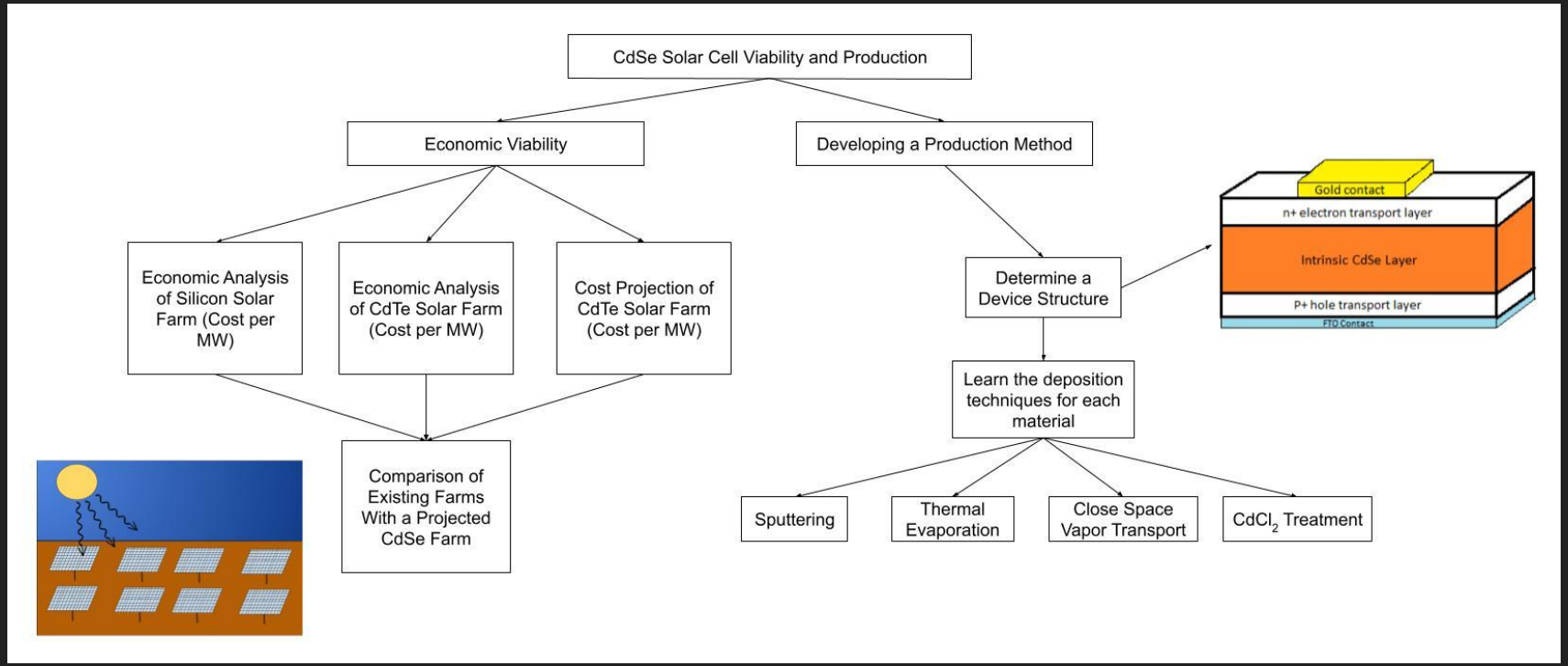
Project Overview

- Cadmium Selenide is an undeveloped solar cell material that could help increase the efficiency of silicon solar cells.
- Very little work has been done to develop the fabrication process for CdSe solar cells.
- Major companies like first solar are starting to show interest in the material.
- It is suspected that CdSe can be manufactured in a similar process as CdTe, a material with a well defined process.
- It is our goal to fabricate a CdSe cell with 5% efficiency and write a well written report on everything we learn through our fabrication process.

Detailed Design and Visuals



Functionality

- This project is mostly a proof of concept for a Cadmium Selenide solar panel
- A full scale product would be integrated into a full solar panel, so we are doing an economic study to predict how the cell would work in the field

Technology Considerations

- Front and back contacts
  - Indium Tin Oxide (ITO) and Fluorine Tin Oxide (FTO)
    - Since the CdSe cell would be on top of a Si cell, the contacts need to be conductive and transparent
- CdS
  - Electron Affinity is approximately equal to that of CdSe (This means CdS will be a good electron transport layer.
- a-(Si, C)
  - Similar Valence band level to that of CdSe. This means a-(Si, C) will be a good hole transport layer.
  - Also, because it is amorphous it will easily deposit onto CdSe.
- Thermal Evaporation
  - Although better manufacturing methods exist, this is the only manufacturing method available to us at Iowa State

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Areas of Concern and Development

- One concern is the cost estimation of the CdSe cell
  - We will be estimating the cost effectiveness of sacrificing efficiency for low manufacturing cost
- Another concern is to maximize the efficiency obtained from the cell
- Environmental toxicity
  - This affects the location we can put the cell
  - The cell will melt and release toxic chemicals if in a house fire, but is fine to be put in a desert

Conclusions

- The solar cell we make will not be completely representative of exactly what would be implemented in a utility scale farm
  - This is why we will try to replicate the conditions experienced in the field
- We will not be fabricate the CdSe cell on top of a Si cell, but we will design it as if it is being designed on top of a Si cell
  - This changes some of the design decisions we make
  - We are sacrificing efficiency for accuracy of how it will truly be implemented in a solar farm