

# A Comprehensive Literature Review of Solar Cell Technologies

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## Introduction

As the clean energy transition continues, photovoltaic solar remains a hot topic of research. I wanted to learn why the technologies we use are the standards in clean energy.

## Not sure on the name here?

I completed a literature review of existing photovoltaic technologies. Through this review, I found four generations of photovoltaic cell, where each improves upon the last in efficiency but becomes more expensive.

## First Generation

- Crystalline-silicon cells
- Mature technology
- High efficiency
- Low cost



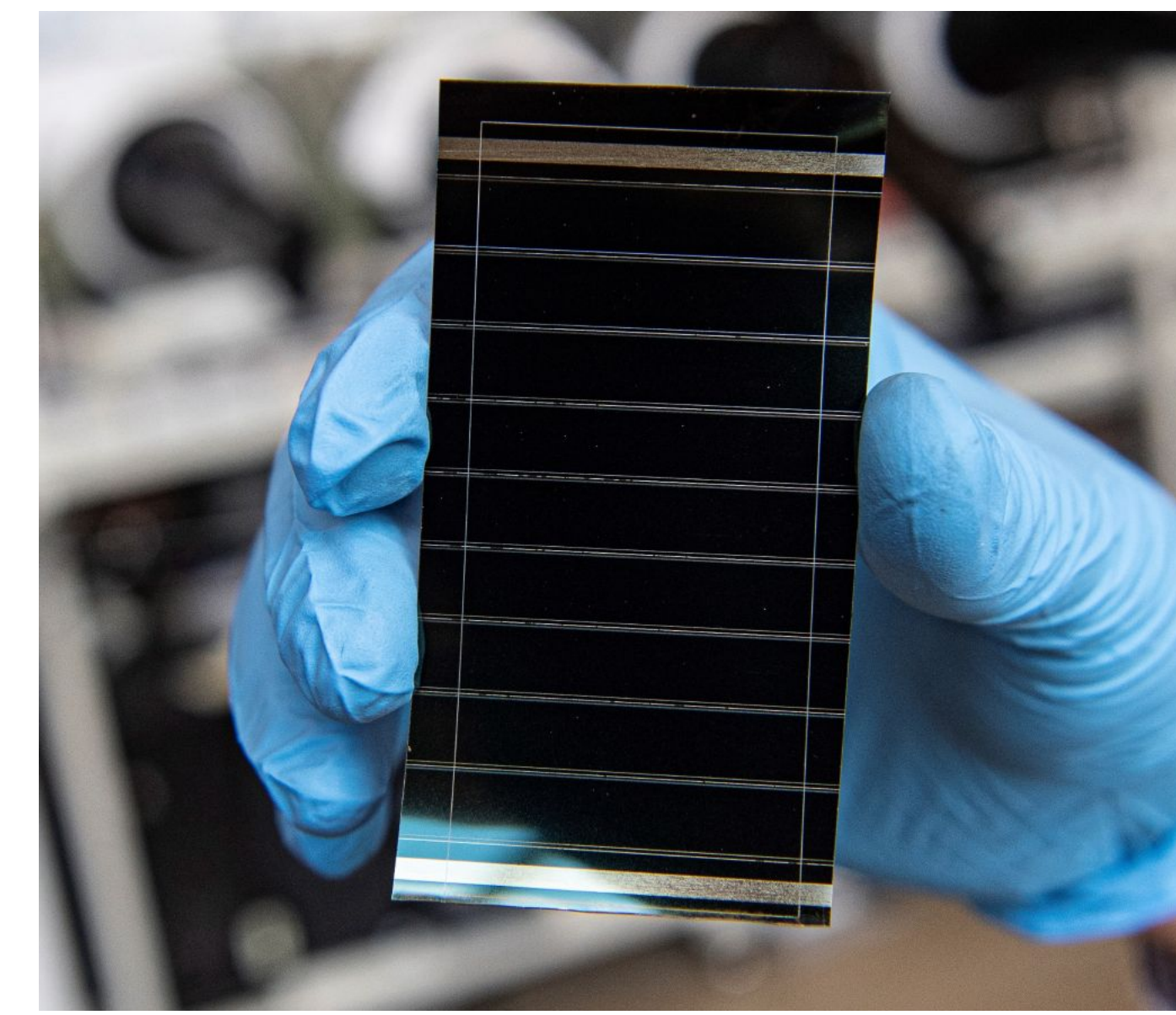
## Second Generation

- Thin-film cells
- Similar efficiency to first-generation
- Low cost
- Can conform to surface shapes



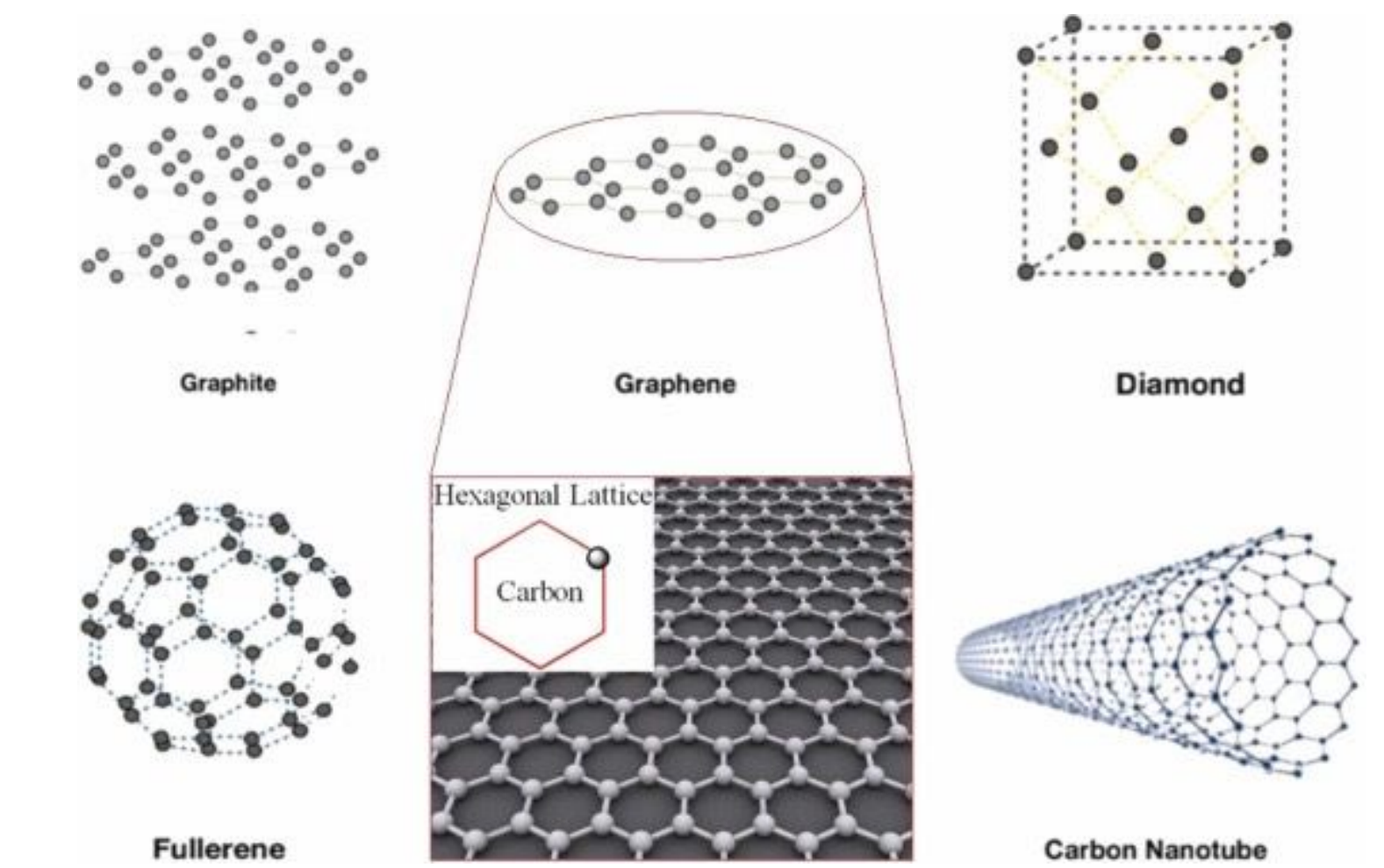
## Third Generation

- Hybrid organic cells
- Perovskite
- First to break the Shockley-Queisser limit on efficiency



## Fourth Generation

- Hybrid inorganic cells
- Graphene is heavily used
- Improved longevity
- Eventually low cost, currently high cost from graphene



## Outcome

- First-generation cells are more useful in the short-term
- Second-generation cells are useful for mobile installations such as vans and for aesthetics, such as on roofs.
- Third and fourth generations will likely surpass first- and second-generation cells eventually but need more research.
- Tandem panels with third- and fourth-generation technologies on C-Si cells create a middle ground of cost and efficiency
- Future Research should focus on graphene, coating technologies for perovskite cells, and tandem solar technologies that combine multiple cell types.
- Improving first-generation cells is helpful, but the Shockley-Queisser limit prevents infinite improvement

## References

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