Qeios

Peer Review

Review of: "A Brief Review of the Optoelectronic Properties of Delafossite Materials for Solar Cell Applications"

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Reviewer Report

Manuscript title: **A Brief Review of the Optoelectronic Properties of Delafossite Materials for Solar Cell Applications**

The provided manuscript will be a valuable contribution to the scientific literature after a small amount of revision and correction. However, the current objectives and novelty of the provided article are opaque, the English language should be significantly improved, and the overall quality of the information provided doesn't comply with the journal's requirements. I have a few minor comments for the authors to maintain a good standard. After these comments, the paper is suitable for publication. After filling in these comments, I think the current research paper is more appropriate for publication. I added the comments according to section-wise. Thank you.

Clarity and Context:

1. Please elaborate on how **delafossite materials** compare to other solar cell materials in practical applications, particularly beyond theoretical efficiencies.
2. The introduction references multiple generations of solar cells. Could you clarify how **delafossite materials** specifically align with the goals of **third-generation solar cells**?

Technical Details:

1. Some synthesis methods are briefly mentioned. Could you provide additional details or references for less common methods, such as **ultrasonic processing**?

doi.org/10.32388/QOVTWB

2. Are there specific challenges associated with the **scalability of hydrothermal methods** for industrial applications of **delafossite materials**?

Data Presentation:

1. The tables, particularly those showing **band gap values and efficiency comparisons**, are informative. Could you include **error margins or variability** in these values, especially for theoretical calculations?
2. Can you provide a **direct comparison chart** of delafossite materials' efficiency against other advanced materials used in solar cells?

Figures and Visuals:

1. Figure 1 presents crystal structures but lacks a clear description of their implications for **electronic properties**. Could you enhance the figure caption to explain these relationships?
2. In Figure 4 (Voc vs. light intensity), please add a discussion on how these results may impact **real-world solar cell performance**.

Discussion and Conclusion:

1. The discussion mentions **scalability issues** but does not explore potential solutions. Could you include a section on **future work** that addresses these challenges?
2. The conclusion references a theoretical efficiency of **28%**. Can you provide additional context on how this compares with **practical efficiencies** observed in experiments?

References and Citations:

1. Some citations appear **outdated or generic** (e.g., solar cell reviews from 2015). Are there more **recent studies or breakthroughs** that could be included?
2. Could you provide references for statements regarding **doping effects on electronic properties**, such as how **FO doping** increases the band gap?

Formatting and Consistency:

1. The formatting of tables and figures could benefit from **standardization**, particularly to enhance ease of comparison.
2. Ensure that all **acronyms** (e.g., DSSC, SLME) are defined upon first use for **accessibility** to broader audiences.

Applications and Impacts:

1. Can you expand on the potential **environmental benefits** of delafossite materials compared to other materials, such as **perovskites**?
2. The paper mentions challenges in **absorption efficiency** due to wide band gaps. Are there strategies (e.g., **doping or heterostructures**) that could mitigate these limitations?

Declarations

Potential competing interests: No potential competing interests to declare.