

Dear Editor,

We like to express our appreciation to the reviewers for their comments. We are resubmitting the revised version of the paper number pssa.202400351. We have studied the comments of the reviewer carefully, and have changed the text according to the comments they have listed. The location of revisions is pointed by blue color in "RevisedManuscript.pdf". Below we refer to each of the reviewer's comments.

## Response to Reviewer #1

**Comment 1.** *The authors could consider mentioning where does the iron come to the samples? Is it in the wafers to begin with after the crystal growth or is some intentional iron contamination done prior to device processing? In my opinion this information would be worth mentioning in the manuscript.*

**Reply:**

The aim of the research was added in the introduction part (page 2, paragraph 3 (last paragraph in the Introduction), line 1-2).

**Comment 2.** *What was the size of the samples and solar cells used in the experiments? Was the whole sample/cell surface illuminated during the experiments or just part of it locally?*

**Reply:**

**Comment 3.** *Based on the reported sheet resistance values, the emitter and back surface field diffusions are quite heavy and could thus act as strong gettering sinks for iron during the device processing. Could the authors comment on this? This could lead to rather uneven distribution of iron in the samples and also the iron being in different forms in different locations. Does this affect the results and if yes, how? (Perhaps here the fact that the light used in the IV-measurements was monochromatic with a wavelength of 940 nm plays a role.)*

**Reply:**

**Comment 4.** *Keeping in mind the cell structure including e.g. strong emitter and BSF diffusions, the reported value of  $\tau_{\text{other}}$  (2.2 ms) seems quite high. Could the authors comment on this? Were there any uncontaminated reference cells included in the experiments? (These would perhaps be good references also elsewhere in the manuscript.) Was their lifetime characterized to back up this claim and the resulting validity of  $\tau_{\text{other}}$  being much much higher than  $\tau_{\text{feb}}$ ?*

**Reply:**

**Comment 5.** *Was the iron concentration in the samples/cells verified with some of the well-established methods for iron concentration determination such as surface photovoltage method (SPV)? That would provide also simultaneously a good reference value for the diffusion length value determined in the manuscript.*

**Reply:**

**Smaller Comment 1.** *The authors could consider moving the experimental from the end to the second section in the paper. There is a lot of crucial information in the experimental part that is needed to understand the results properly. Therefore, it could be very useful for the readers to read the experimental part first before going into the results section.*

**Reply:**

Overall, we also support the opinion that the ability to read the experimental part first before going into the results section is useful, customary, and fully justified. However, in this case, we must adhere to the "Guide for Authors" and the L<sup>A</sup>T<sub>E</sub>X template which state that the order of the sections must be as follows: "Title – Author(s) – (Dedication) – Affiliation(s), – Keywords – Abstract – Main text – (Experimental/Methods Section) – Acknowledgements – References – (Biographies) – Table of Contents text [Sections in brackets are only present in certain article types]".

**Smaller Comment 2.** *The paper would benefit from one round of language and typo checks. There were quite a lot of such problems all around the paper. Here are just some examples:*

*Title: Should it be dissociation kinetics and not kinetic?*

*Page 1, line 42: "and have a solid understanding of some defects". Something wrong in this sentence, should it be e.g. "and that there is a solid understanding of some defects."*

Page 4, lin49: "the lifetime associated with... (about 2.2  $\mu\text{m}$ )" Unit wrong, should be ms?

Page 6, line 29: "These behaviour..." Should be This behaviour?

Figure 5 caption: "carrier generate rate"

etc.

We apologize for any language errors. A bilingual speaker has revised the text, and we hope it shows improvement.

**Reply:**

## Response to Reviewer #2

**Comment 1.** *Grammatical error in the last sentence of the abstract.*

**Reply:** The revised last sentence in the abstract reads:

"The cat came to work."

The manuscript has been revised. We sincerely hope to see a significant decrease in grammatical errors.

**Comment 2.** *Figure1 and TOC, it looks nice, but it is difficult to understand. Authors need to add inputs and outputs. One of outputs will be K values. For example, add an arrow coming out from the box named "Discussion & Conclusion", and write K. Otherwise, readers will not understand what is this figure for. Page2, Line40, there is an explanation of "First step". I do not find "Second step".*

**Reply:**

**Comment 3.** *A main result is that K values depends on the light source, namely spectral shape. These values were obtained by fitting equation(1) to the plot in Fig. 6(a). I have a doubt that K should not change by experimental condition. It is an intrinsic constant. For the fitting, N\_FeB was assumed to be constant in the manuscript, but it may not.*

**Comment3 is critical. Explanations are required.**

**Reply:**

**Comment 4.** *A unit " $\text{cm}^3$ " is in equation(5). It should not be.*

**Reply:** We respectfully disagree with the Reviewer. On one hand, the factor of  $5.7 \times 10^5$  corresponds precisely to the case when the acceptor-doping concentration is measured in  $\text{cm}^{-3}$  [1, 2, 3]. On the other hand, since the temperature is measured in K and  $p$  in  $\text{cm}^{-3}$ , the factor  $\frac{1}{K \text{ cm}^3} \times \frac{T}{p}$  is dimensionless, and thus, the expression

$$R_a^{-1} = 5.7 \times 10^5 \frac{\text{s}}{\text{K cm}^3} \times \frac{T}{p} \exp\left(\frac{E_m}{kT}\right) \quad (1)$$

has the dimension of time.

**Comment 5.** *I did not find where Eq.(3) and (4) are used. Exactly the same equations are in the cited articles. These equations and related sentences can be deleted so that readers can easily understand the content.*

**Reply:**

Sincerely yours,

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## References

- [1] C. Möller, T. Bartel, F. Gibaja, K. Lauer, *J. Appl. Phys.* **2014**, *116*, 2 024503.
- [2] N. Khelifati, H. S. Laine, V. Vähänissi, H. Savin, F. Z. Bouamama, D. Bouhafs, *Phys Status Solidi A* **2019**, *216*, 17 1900253.
- [3] J. Tan, D. Macdonald, F. Rougieux, A. Cuevas, *Semicond Sci. Technol.* **2011**, *26*, 5 055019.