

TCAD Parameters for 4H-SiC: A Review

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A very promising candidate for a more power efficient (e.g., in power electronics) replacement of Silicon is the wide band gap material 4H-SiC. To describe its physical properties in Technology Computer-Aided Design (TCAD) simulations many models with accompanying parameters have been proposed. Often these contradict each other which makes it challenging to identify a suitable initial set of parameters. In addition, the origin of popular values, e.g., which of the many SiC polytypes was used during characterization, is often unclear, because authors cite only the latest research but not the, sometimes decades old, original publication. This makes it hard to evaluate the suitability of a model for the problem at hand.

To tackle these issues we conducted an extensive literature review on TCAD parameters for 4H-SiC. With this research we aim to decrease the entrance barrier to 4H-SiC simulations and to identify shortcomings in the state-of-the-art, highlighting areas respectively parameters that would benefit from in-depth investigations.

In this presentation we report on the current status of this literature review. After a description of the methods we utilized in our analyses we summarize the major insights we gained for the topics permittivity, density-of-states mass, impact ionization, incomplete ionization and band gap. We also present the recently finished evaluation of charge carrier recombination and, finally, conclude with shortcomings we were able to identify that demand further research.

Type of presentation (in-person/online)

in-person presentation

Type of presentation (I. scientific results or II. project proposal)

I. Presentation on scientific results

Authors: GSPONER, Andreas (Austrian Academy of Sciences (AT)); BURIN, Jürgen (Austrian Academy of Sciences (AT)); GAGGL, Philipp (Austrian Academy of Sciences (AT)); WAID, Simon Emanuel (Austrian Academy of Sciences (AT)); BERGAUER, Thomas (Austrian Academy of Sciences (AT))

Presenter: BURIN, Jürgen (Austrian Academy of Sciences (AT))

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