

ASPIN3 demo version

Introduction

The demo version showcases the result analysis user interface of ASPIN3 simulator. **It is not possible to run new simulations**, only analyze the included results. The purpose of the demo version is to give the user a first impression of the ASPIN3 graphical user interface. By following the walkthrough below the user becomes familiar with main features of the user interface.

Structure description

The results included in the demo version include a simulation of an illuminated current-voltage characteristic for a two-dimensional pn-junction – a simple solar cell model. Majority of the structure is n-type, while a rectangular region in the top left corner is p-type. The current voltage-characteristic under AM1.5G illumination is calculated for various illumination intensities. With the graphical user interface variables such as electric potential, electric field, electron concentration and hole concentration among others can be observed.

Requirements

To run the demo version a MATLAB Compiler Runtime (MCR) release 2014b (8.4) 64-bit needs to be installed on your system. To obtain a copy of the MCR go to:

<http://www.mathworks.com/products/compiler/mcr/>

Walkthrough

1. Make sure that the **correct MCR is installed**, otherwise the demo version will not start.
2. Start the **ASPIN3 demo.exe**. It might take a while to open on the first run. On the right top side of the screen a **controls panel** is open that contains the geometrical representation of the simulated structure and sliders that control the results. On the right bottom side of the screen, an **info panel** is displayed. At start it holds information about the current-voltage characteristic. On the right side of the screen the **plots panel** displays the results.
3. In the **plots panel** in the top right corner, there is a **variable selector**. Click on this dropdown menu and select **p** to display free hole concentration. Other variables can also be selected here. A description of each variable is given in the title of the plot, when the variable is selected.
4. Top left side of the **plots panel** has icons for **zoom**, **pan**, **rotation**, **data cursor** and the button to switch between **one or four plot axes** with results. You can freely try these tools, however return to the one plot axes view in the end. If you get stuck with zoom, pan or rotation tools, right click on the plot and select “reset to original view”.
5. On the bottom left side of the **plots panel** there are radio buttons that **select the type of the scale** for each axis. You can choose linear scale **lin** or logarithmic scale **log**. For now choose logarithmic scale for the z axis, to view the hole concentration in logarithmic scale.
6. On the right bottom side of **the plots panel**, there are radio buttons that **select the cross-sectional profile**. You can choose two-dimensional view, or the cross-sections parallel to x and y axes. The axes are defined in the graphical representation window, and are oriented in such

a way, that the light enters the structure in x direction (rotated 90° clockwise with respect to the usual Cartesian coordinate system). Select x radio button to select the cross-section parallel to the x axis. You can also set the y axis scale to logarithmic, for a better view of the cross-section.

7. The **sliders** in the **controls panel** can be used to control the position of the cross-section. Move the **y slider** to move the cross-section parallel to the x axis (chosen in previous step) along the y axis. The line of the cross-section is also shown in the graphical representation of the structure.
8. Change the **Voltage slider**, to move to a different operating point of the current-voltage characteristic - change the applied voltage to the structure and observe how the profile of hole concentration changes.
9. Change the **gen.scaleFactor** slider, to change the illumination intensity – 1 corresponds to illumination intensity of one sun.
10. This concludes the guided walkthrough. Feel free to observe other variables in different scales and cross-sections and play with sliders to get a feel of how the ASPIN3 user interface behaves. Try the EBD from variable selector (energy band diagram) and the Jtotvect (current flow representations). Be careful to select the right scale, as some variables can only be displayed in log scale.