知乎 TCAD仿真软件



Silvaco 笔记——1.参数拉偏(自动改变参数,循环跑)



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在Silvaco仿真中,有时需要研究某一参数对结果的影响,当要设定的参数值很多或者有多个参数需要更改时,每次仿真结束后手动——改值很麻烦,Silvaco中可以通过循环的方法自动更改参数值。

主要两种方法:

今天先介绍第一种方法: (主要适用于整个XXX.in的参数变化,比如尺寸、掺杂参数变化)

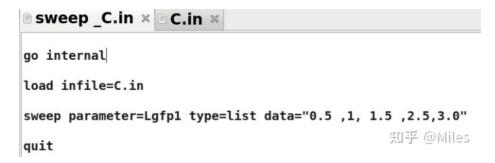
下次介绍第二种方法: (主要在局部loop, 适用于跑IV, 如不同Vgate loop)

在器件仿真的.in文件(<u>XXX.in</u>)中先将参数设定为某一定值,然后另外创建一个新的.in文件(<u>XXX_loop.in</u>),用来进行更改参数。

在XXX.in文件里面,将要修改的参数设置为变量:



同文件下,重新建立一个跑循环的XXX_LOOP.in:



本例子中,修改参数为Lgfp1,依次跑的参数值: 0.5, 1,1.5,2.5,3.0。原理就是通过 XXX_LOOP.in调用XXX.in,依次跑变量的每个值。除了支持这样单参数改变,还支持多参数一起 修改。

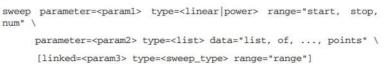
语法:

go internal load inf="<input file>" sweep parameter=<参数> type=<type> [range|list]="num1, num2, ..." save type=sdb outf="<output file>" quit

Silvaco deckbuild 手册里面有详细报道:

B.5.10 sweep

Syntax



Description

The sweep command generates an experiment from all combinations of individual parameter values. The first parameter changes with the highest frequency. The final parameter changes with the lowest frequency.

A parameter should be the name of a variable in the template deck. The names (e.g., <param1>) cannot be abbreviated. They must be exactly as they appear in the template deck.

The type must be either linear, power, or list. If the type is linear or power, then the range should be three numbers. The first number is the initial value of the parameter, the second number is the final value of the parameter, and the third number is the number of points. If the type is "list", then the data is just the list of values that should be assigned to the parameter.

Any parameter defined with the parameter command varies independently with all other parameters defined with the parameter command. For example

```
sweep parameter=x type=linear range="1,3,3" \
    parameter=y type=linear range="10,30,3"
```

The x parameter is given the values 1, 2, 3 and the y parameter is given the values 10, 20, 30. This command would generate an experiment with 9 trials where each x value is paired with all y values: (1,10), (2,10), (3,10), (1,20), (2,20), (3,20), (1,30), (2,30), (3,30)

But any parameter defined with the linked command is tied to the previous parameter. For example

```
sweep parameter=x type=linear range="1,3,3" \
linked=y type=linear range="10,30,3"
```

(where y is now linked to x) would generate an experiment with 3 trials where "x" and "y" vary together: (1,10), (2,20), (3,30)

The order of these commands is important with any particular linked variable tied to the immediately previous variable. For example

```
sweep parameter=A type=linear range="1,3,3" \
    linked=B type=linear range="1,3,3" \
    parameter=C type=linear range="1,4,4" \
    parameter=D type=linear range="1,5,5" \
    linked=E type=linear range="1,5,5" \
```

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https://zhuanlan.zhihu.com/p/412937852

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Example 1

In a linear sweep, the parameter values are evenly spaced.

```
sweep parameter=x type=linear range="1,4,7"
```

This generates for x the values:

- 1
- 1.5
- . 2
- 2.5
- 3
- 3.5
- 4

Example 2

In a power sweep, the log of the parameter values are evenly spaced.

```
sweep parameter=y type=power range="1e10, 1e15, 6"
```

This generates for y the values:

- 1e10
- 1e11
- 1e12
- 1e13
- 1e14
- 1e15

Example 3

The data is a list of values to assign to the parameter.

```
sweep parameter=z type=list data="1,2.5,3,3.1,4"
```

This assigns each of the values (one at a time) to z.

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Example 4

The number of trials in the experiment is the product of the number of points for each independent parameter.

```
sweep parameter=x type=linear range="1,4,7" \
    parameter=y type=power range="1e10, 1e15, 6"
```

This generates an experiment with 42 trials. All the values of x in combination with all the values of y. Adding another variable:

```
sweep parameter=x type=linear range="1,4,7" \
    parameter=y type=power range="1e10, 1e15, 6" \
    parameter=z type=list data="0, 2, 3"
```

would increase the number of trials to 126. All 42 trials from the previous experiment with z=0, and all 42 trials with z=2, and all 42 trials with z=3.

Example 5

Linked variable do not increase the number of trials in an experiment.

```
sweep parameter=temp type=linear range="200,400,5" \
    linked=conc type=power range="1e15,1e19,5" \
    linked=height type=list data="1,1.1,1.3,1.6,2"
```

This generates an experiment with 5 trials with the values for temp, conc, and height.

```
200, 1e15, 1.0
250, 1e16, 1.1
300, 1e17, 1.3
350, 1e18, 1.6
400, 1e19, 2.0
```

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注意事项:

```
1. <参数> 要在XXX.in 中用 SET 定义: SET para1=xxx .
```

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3. 在XXX.in的文件里面,保存的数据和结构应该是变量名,否则loop时会被覆盖。设置例如: structure outf = GaNhemt _GFP1_ \$'Lgfp1'.str; GFP1是循环变量,\$'Lgfp1'是循环变量值。

硬核码字不易, 点个赞再吧 @Miles

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Lyon

发表于DeepA...

为什么要对参数设先验(

最近在看PRML,第二章的 "Probability Distribution"里面的 "Binary Variables&# 里面对于参数的先验(Prior) 论述。在这里做一个记录,

庞子奇