Internship - Optimization of a phase change memories simulator using improved numerical methods M/F

Reference: 2022-25337

6 months internship
Location: Crolles (38)

Job description

Many of STMicroelectronics' products are based on technologies that integrate embedded memory. In this context, the development of new memory cells to meet future performance and miniaturization requirements is a key issue. For the purposes of these developments, simulation tools are widely used to understand, predict, and optimize the operation and performances of these new memory cells.

The subject of this internship takes part in the technological development of phase change memories (PCM) that use the resistivity change induced by a phase change of chalcogenide type materials to store information. These materials undergo complex phase transformations during memories' operations. To help the development of this technology, a simulator able to reproduce the evolution of the material and the programming operation of the memory is being developed.

The physics of phase transformations of the active material is modeled using a multi-phase field method. This model is coupled with electro-thermal physics in order to simulate the full operation of the memory. While the multi-phase field model is already able to perform some simulation, the coupling with the electro-thermal solver is still in development.

The objective of this internship is to redevelop the existing simulator using efficient numerical methods, such as finite elements or finite differences. To do that, you will take advantage of open-source libraries providing such numerical methods. The goal is to propose an improved version of the simulator that will enable future developments: improved electro-thermal models, faster simulation, multi-materials simulation, ...

The work will be organized as follows:

- training on the existing model and simulator
- choice of numerical method library
- implementation of the multi-phase field model
- coupling with the electro-thermal model
- model validation

Profile

- Required:
  - Knowledge in numerical methods (finite differences, finite elements, ...)
  - Good programming skills
- Nice to have:
  - Experience with numerical methods libraries (FreeFEM, DealII, Fenics, ...)
  - Familiarity with unix and git

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