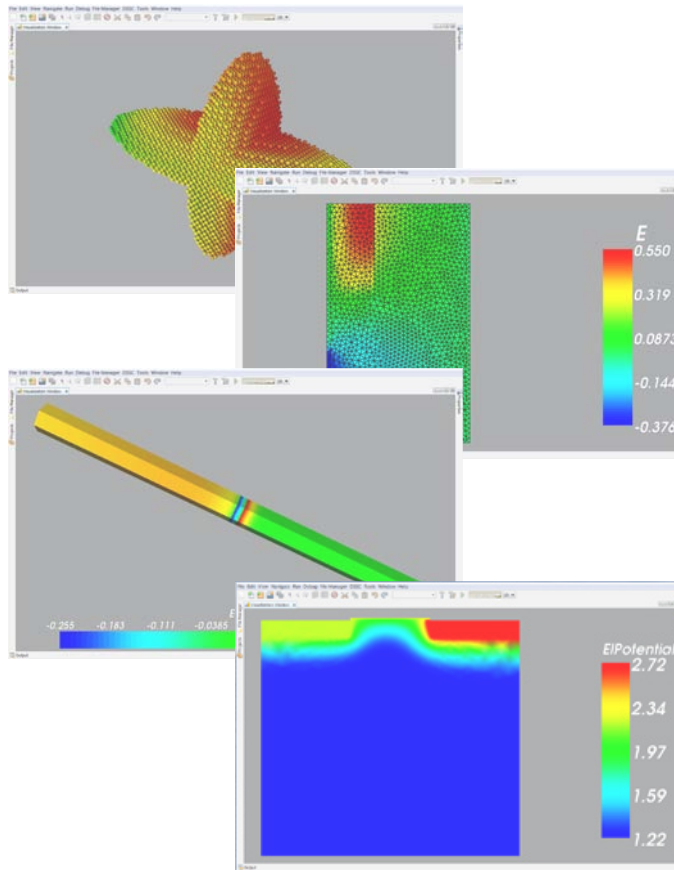
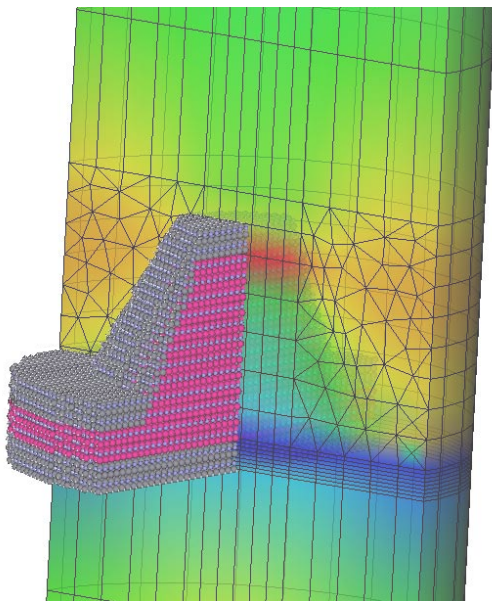




**tiberCAD** is a software solution dedicated to people working on the cutting edge of semiconductor technology, sensing, energy harvesting, organic and molecular optoelectronics, MEMS technologies. Modern devices impose new challenges due to the wide range of time and length scales involved. **tiberCAD**, a multiscale CAD simulation tool, is able to couple physical models operating at different scales in the same simulation. Fields of application are particle transport, heat dissipation, mechanical deformation. Examples of use are modeling of quantum dot-based LED diodes, leaking currents in MOS-FETs, Dye Sensitized Solar Cell (DSSC), piezoelectric nanogenerators. **tiberCAD** provides novel tools to accomplish the critical requirements imposed by the recent developments in nanotechnologies.



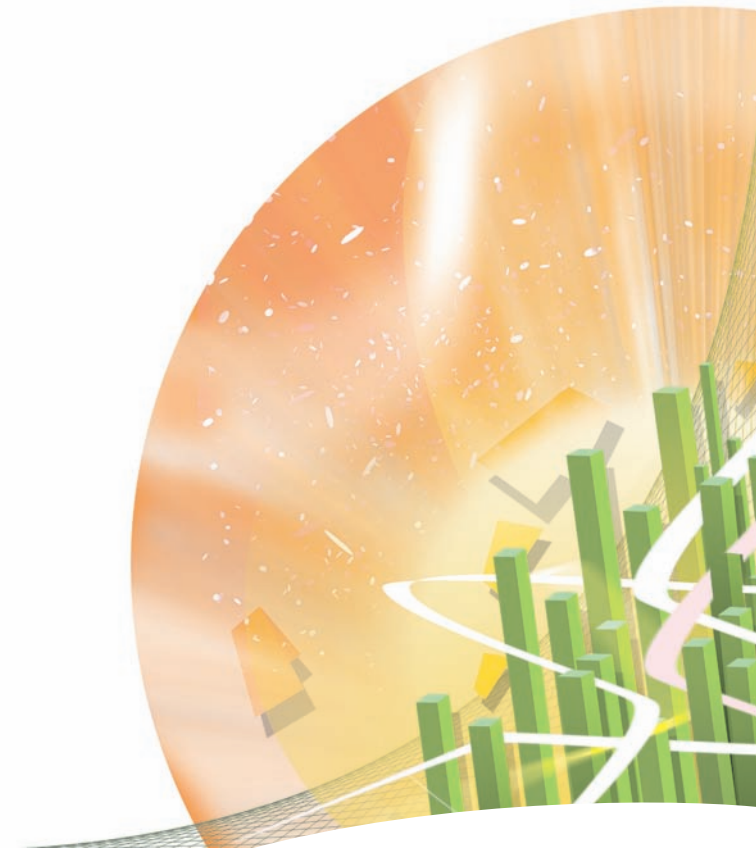
- Project management
- Data exchange with step, iges, brep format
- 1D/2D/3D CAD
- Wizard to define solver options
- Post Processing
- Dockable windows

**tiberlab** S.r.l.

A spin-off of University of Rome "Tor Vergata"  
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 www.tiberlab.com - info@tiberlab.com



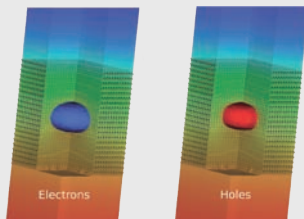
**tiberCAD**  
 multiscale simulation



a software developed by



## Drift-Diffusion



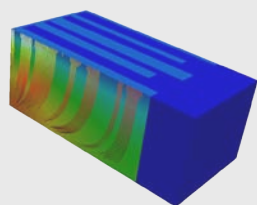
Transport of electrons and holes is calculated based on the **Drift-Diffusion** approximation. Mechanical, thermal and quantization effects can be included self-consistently by coupling to the **Elasticity**, **Thermal** and

**Envelope Function Approximation** modules.

### Main Features

- Most common models for mobility, recombination and traps
- Accounts for full strain tensor and piezoelectric field
- Band parameters based on strain corrected bulk  $k \cdot p$  model
- Easy coupling to Thermal Elasticity and quantum modules

## Dye Solar Cell



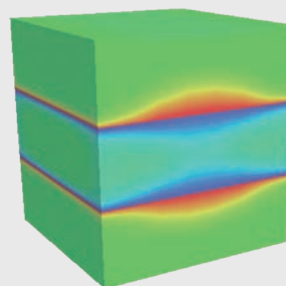
A finite element based electrical model of a **DSC**. The module allows the modeling of a complete **DSC** (including porous material, electrolyte region and contacts) with generic geometry and dimension (1, 2 and 3D). User-defined dyes and source spectrum can be employed.

Different parameters, for the electron recombination and charge carrier mobility, can be set.

### Main Features

- Modeling of the entire cell in 1, 2 and 3D
- Several dyes available
- Inclusion of traps
- Visualization of all charge carriers, currents and densities

## Elasticity

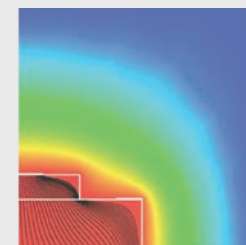


**Elasticity** brings features developed for continuous elasticity into device modeling. The coupled treatment of the electro-mechanical problem allows to explore the feasibility of devices where the mechanical deformation plays a fundamental role.

### Main Features

- Continuous elasticity
- Converse piezoelectric effect
- Isotropic and anisotropic stiffness tensor
- Lattice mismatch induced strain
- Application of an external surface force

## Thermal



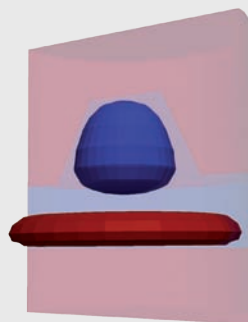
**Thermal** provides the temperature maps obtained by the balance between the Fourier heat transport and the Joule heat. The deep integration with **Drift-Diffusion** makes **Thermal** a powerful

tool for thermal analysis of devices

### Main Features

- Fourier heat transport
- Electrons and holes Joule and recombination heat
- Peltier effect
- Anisotropic thermal conductivity

## Envelope Function Approximation



Quantum calculations in the framework of **Envelope Function Approximation (EFA)**. The solution of the eigenvalue problem provides eigenstates and eigenfunctions of the system, particle densities and optical emission spectrum.

### Main Features

- Modeling of 1, 2 and 3D structures: quantum dots quantum wires, NWFETs
- Zincblende and wurtzite crystalline structures fully supported including strain correction
- Single band and multiband  $6 \times 6$ ,  $8 \times 8$   $k \cdot p$  model
- Self-consistent Schrödinger/Poisson simulation

