



## CHAM Product Update

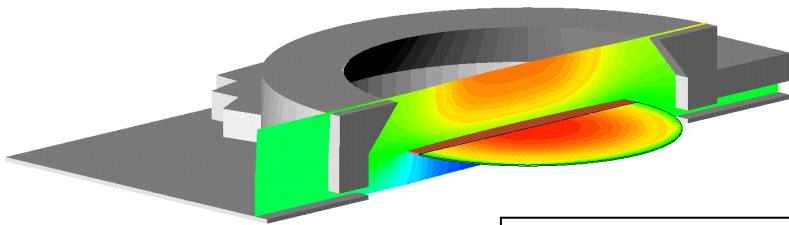
Pioneering CFD Software for Education & Industry

### PHOENICS-CVD Chemical Vapour Deposition Simulation Software For Equipment Design and Process Optimization

#### Why simulate CVD?

Simulation is used to improve the design of CVD equipment, to reduce the need for prototyping and to answer the "what if" questions of engineers. Using the PHOENICS-CVD software system engineers can:

- optimize CVD reactor design;
- tune process parameters to improve yield;
- explore new processes before equipment is purchased;
- troubleshoot poorly operating processes and equipment.



Cutaway diagram of a Jipelec-type CVD reactor used for silicon deposition from silane. The contours show silane concentration near the symmetry plane, and silicon deposition rate on the wafer.

#### Features

PHOENICS-CVD is an integrated software system designed to simulate the behaviour of a wide range of CVD reactors; this involves the modelling of fluid flow and heat transfer in a multi-component gas, including both gas-phase (homogeneous) and surface (heterogeneous) chemical reactions and incorporating plasma effects.

Implementation is by means of a graphical, menu-driven, object-orientated interface, coupled with a library of generic reactor designs providing an easy route to problem set-up and modification.

PHOENICS-CVD offers:

- Simulation of steady-state or transient (process start-up and shut-down) behaviour in Cartesian, Polar or Body-Fitted-Coordinate grids;
- Multi-component diffusion and gas properties with a choice of models;
- Thermal diffusion with a choice of options;

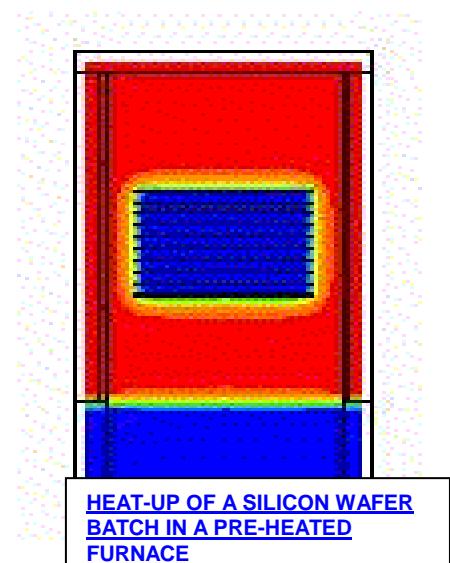


- Gas and surface chemical reactions, with built-in options and the provision for user-coding if required;
- Surface-to-surface radiation;
- Plasma modelling using an effective drift-diffusion model;
- Data files for transport, thermodynamic, material, optical and chemical reaction parameters;
- Platform independence: ability to run on PCs (Windows & LINUX), UNIX workstations and parallel-processing- or super-computers.

## Application examples

PHOENICS-CVD has been used to simulate: -

- Silicon nitride formation in a hot wall batch reactor;
- Tungsten deposition in a single wafer, cold-wall reactor;
- Polysilicon growth in an RTP reactor;
- Plasma-enhanced deposition of amorphous silicon;
- Polysilicon single wafer reactor processes;
- Metalorganic deposition of titanium nitride;
- SiO<sub>2</sub> deposition in a commercial reactor.



## Validation

PHOENICS-CVD has been validated for a range of CVD processes. The development and experimental verification of PHOENICS-CVD are documented in over 20 publications; copies are available from CHAM.

For further information about PHOENICS-CVD, licence arrangements, consultancy, seminars and courses, and more specifically what it can do for you, contact [Sales@cham.co.uk](mailto:Sales@cham.co.uk).

## Links

[CVD Applications Library](#)  
[PHOENICS-CVD](#)