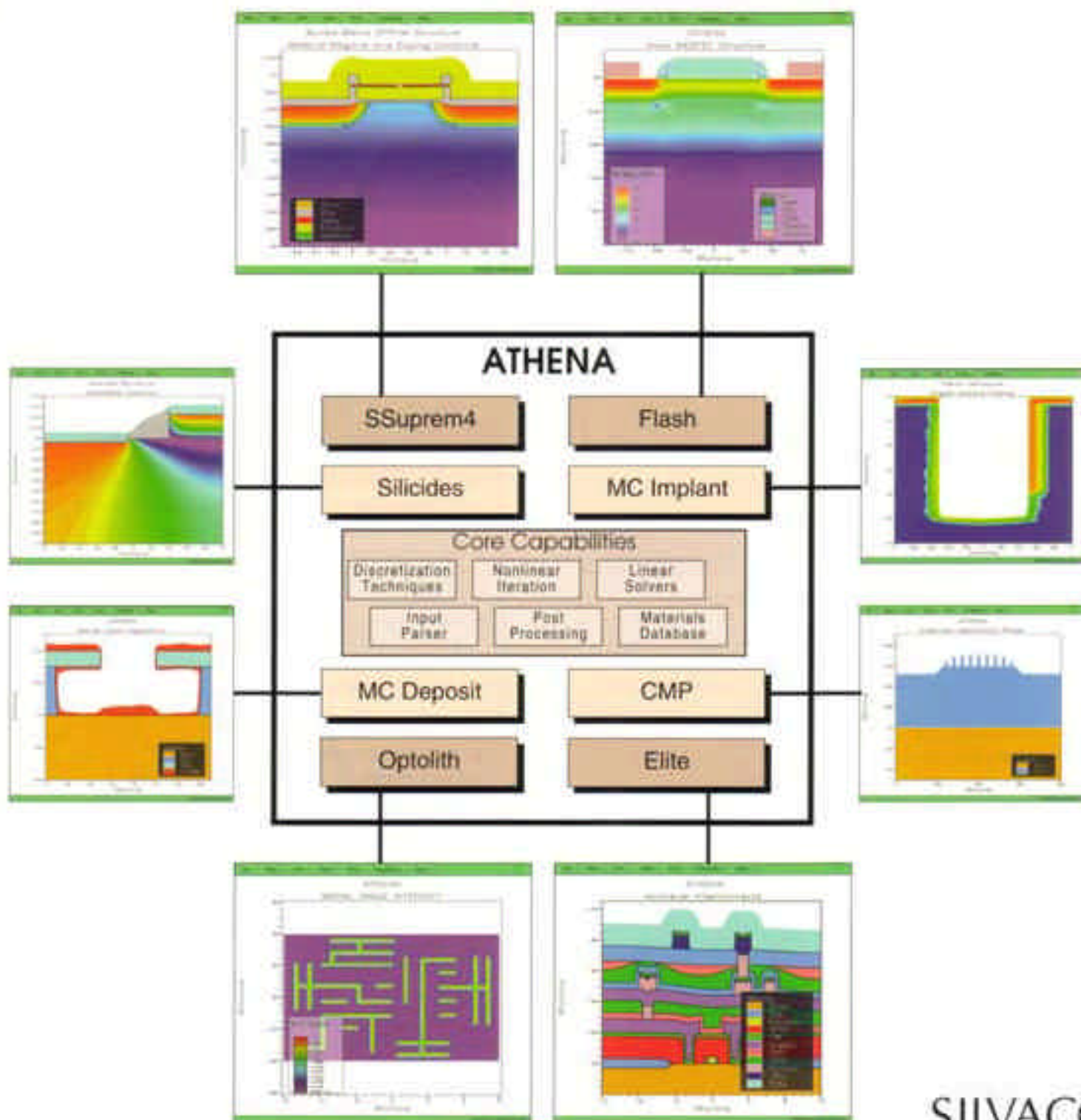


Process Simulation Software

ATHENA is a versatile, modular and extensible solution for one and two dimensional process simulation



ATHENA is the advanced 2D process simulation tool set used by developers of silicon and advanced materials technologies.

ATHENA consists of four primary tools and several secondary tools. The primary tools are: SSuprem4 for simulating ion implantation, diffusion, oxidation and silicidation processes for silicon; Flash for simulating implantation, activation and diffusion for advanced materials technologies; Elite for topography simulation; and Optolith for lithography simulation. ATHENA provides additional options for the modeling of silicides and chemical mechanical polish, and for Monte Carlo modeling of ion implantation.

Elite 2D Topography Simulator

- Physically based etch and deposition models
- Material reflow
- Directional and isotropic etch rates
- Beam divergence for dry etch modeling
- Microloading effects
- Deposition by uni-directional, dual-directional hemispherical, planar and conical sources

Monte Carlo Deposit

- Single and dual sticking coefficient models
- Ballistic hard sphere deposition model
- Density variation model
- Surface diffusion model

Chemical Mechanical Polish

- Polish pad degradation model
- Pattern density effects
- Shadowing effects
- Simultaneous chemical and mechanical erosion

Optolith 2D Lithography Simulator

- Models non-planar underlying topography
- 2D aerial image formation
- Phase shifting, binary, and partially transmissive masks
- g, h, i, DUV and broad line sources
- Defocus, arbitrary illuminator shape, spatial filtering and
- partial coherence effects
- State-of-the-art development models
- Post-exposure bake model
- Top and bottom anti-reflective coatings
- High numerical aperture model
- Quadropole illuminator model
- Illumination system aberration model

SSuprem4 2D Silicon Process Simulator

- Pearson and dual Pearson implant models
- Implant induced damage effects
- Tilt and rotation dependent implant model
- Fully coupled point defect diffusion
- Oxidation enhanced/retarded diffusion
- Rapid thermal annealing
- Impurity concentration dependent diffusion model
- Grain based polysilicon diffusion model
- Stress-dependent oxidation model
- Separate oxidation rate coefficients for silicon and polysilicon materials
- Deposition and etch specification via MaskViews
- Epitaxial growth simulation

Silicides

- Simultaneous impurity diffusion calculation
- Diffusion and reaction limited growth rates
- Mobile silicon and mobile metal reactions
- Accurate material consumption model
- Independent rates for silicon and polysilicon materials

Monte Carlo Implant

- Ion channeling effects
- Physically based damage calculation
- Reflected ion effects
- Tilt and rotation dependence
- Crystal orientation dependence

Flash 2D Advanced Materials Process Simulator

- Concentration dependent impurity diffusion model
- Pearson and dual-Pearson ion implant models
- Impurity activation models
- Impurity segregation model
- Epitaxial growth model
- Default characterizations for SiGe, GaAs, AlGaAs, InGaAs and InP
- Complete set of dopant atoms used in advanced materials technologies

Monte Carlo Implant

- Ion channeling effects
- Physically based damage calculation
- Reflected ion effects
- Tilt and rotation dependence
- Crystal orientation dependence