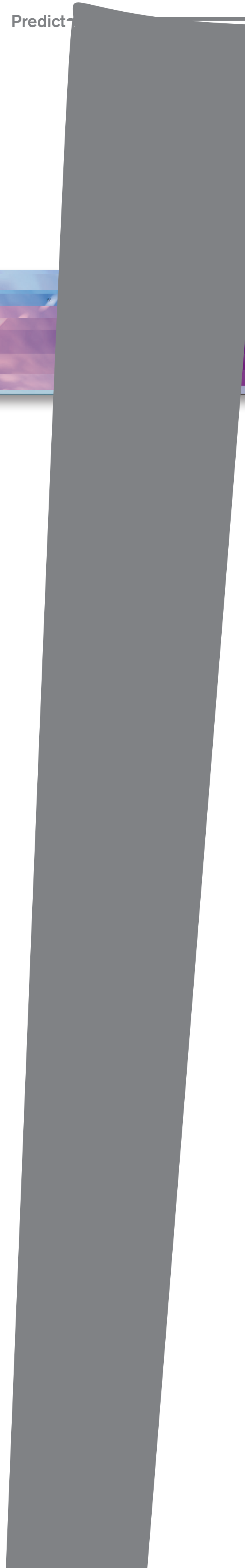

Sentaurus Process

S c P ce S a

Sentaurus Process simulates the fabrication steps in silicon process technologies in 2-D and 3-D. Equipped with a set of advanced process models, which include default parameters calibrated with data from equipment vendors, Sentaurus Process provides a predictive framework to simulate a broad spectrum of technologies, ranging from nanoscale CMOS to high-voltage power devices.

With Sentaurus Process, users can easily simulate process modules and integrate them into complete front end of line (FEoL) process flows. An advanced set of oxidation, diffusion, implantation, and mechanics models, combined with robust mesh generation and structure-editing capabilities, cover important process modules such as ultrashallow junction formation, high-k/metal gate, and strained silicon.

A choice of advanced implantation and diffusion models are available in Sentaurus Process. Analytic implant tables cover an extensive energy range, from sub-keV to several MeV. Efficient and accurate Monte Carlo implantation models handle conditions not well covered by the analytic models such as sidewall doping of narrow trenches.

SRAM Cell simulated in Sentaurus Process

In ultrashallow junction processing, the continual reduction in thermal budgets demands increasingly complex diffusion, clustering, and interface trapping models to achieve an optimum trade-off between minimizing transient-enhanced diffusion and maximizing dopant activation. Spike and laser annealing leads to nonequilibrium point defect–dopant pair concentrations and dynamic clustering. To handle these process conditions, Sentaurus Process includes a five-stream diffusion model as well as models for {311} defects, small interstitial clusters (SMICs), dopant-defect clusters, and transient dopant activation. With process-induced stress being a key technique for enhancing device performance, Sentaurus Process computes all major sources of mechanical stress derived from volumetric changes, thermal and lattice mismatches, and deposited thin films. The complete stress history during processing can be simulated and the resulting stress field can be seamlessly exported to Sentaurus Device for evaluating its effect on electrical performance. A model interface language allows the prototyping and

The graphical user interface (GUI) of Sentaurus Structure Editor features a command-line window in which script commands corresponding to the GUI operations are displayed. Script commands can also be entered directly at the command-line window. Doping profiles and meshing strategies can be defined interactively. The meshing tools, part of Sentaurus Process and Sentaurus Device, can be called from the Sentaurus Structure Editor GUI and the generated mesh and doping profiles can be automatically visualized in Sentaurus Structure Editor.

All interactive operations are recorded and a journal file can be saved, enablin4(t)]TJ0 -1.556 TD8nnte u4(a)-7(t)-1(-2(0(r)-15(u)-12(s S)-11(t)-4(r) c)-13(o(u)-12(s D)-13(e)3(TD[t)-38-