www.mrs.org/meetings/spring2006/

CALL FOR PAPERS

ABSTRACT DEADLINE: NOVEMBER 1, 2005

REMINDER: *In fairness to all potential authors, late abstracts will not be accepted.*

MRS Symposium C: Sub-Second Rapid Thermal Processing for Device Fabrication

This symposium will explore the recent developments in sub-second thermal processing for device fabrication. It will focus on the characterization and physical modeling of phenomena which control the three-dimensional dopant profile in deep submicron devices. As microelectronic device sizes continue to shrink, the total thermal budget must be reduced; and increasing the dopant activation while simultaneously decreasing the junction depth is becoming increasingly difficult. These challenges are accelerating the investigation into "diffusionless" annealing, which can be attained with RTP at millisecond time scales. Dopant diffusion and activation are controlled by interactions of the dopant with native or other defects, or with other dopant atoms. In addition, the presence of interfaces can influence the dopants and point defects. Increasingly aggressive processing trend conditions can enhance these interactions. Examples of these phenomena include enhanced dopant diffusion, dopant-defect clustering, dopant precipitation, dopant out-diffusion or segregation, and Fermi level, as well as stress effects on dopant diffusion. Formulation of physics-based models of all these phenomena is not only desirable but essential for an accurate and truly predictive front-end process simulation capability. To achieve this goal, it is necessary to apply advanced characterization techniques (e.g., two-dimensional junction profiling) to more precisely describe the observed phenomena and to take advantage of the insight offered by atomistic simulation methods which can now be used to model the whole device. This symposium aims to bring together materials scientists, silicon technologists, and TCAD researchers to share experimental results and physical models, demonstrate their importance to the technologies, and identify key issues for future research in this field. The symposium will also explore other device fabrication that has been enabled by sub-second annealing.

Papers are solicited in the following areas:

- Ultrashallow junction formation: laser annealing, flash annealing, co-implantation followed by spike anneal, epi-growth, and other methods
- Experimental extraction of dopant-defect interaction mechanisms and parameters: marker layers and in-situ measurements
- Damage evolution of clusters and extended defects: characterization via SIMS, TEM, DLTS, EPR, positron, x-ray diffraction, etc.
- Dopant-defect clustering: formation and dissolution, and dopant activation/deactivation
- Exploration of transient diffusion mechanisms in amorphous Si, SiGe, etc.
- Amorphization: dopant diffusion in a-Si; dopant behavior at the a/c interface, regrowth, activation by SPER, flash SPER, laser annealing, etc.
- Surfaces and interfaces: point-defect injection and annihilation, and dopant outdiffusion and segregation
- Effect of advanced RTP on grown-in junctions
- Stress effects: uniaxial, biaxial, effect on dopant diffusion and activation, and defects associated with stress relaxation
- Role of impurities and background doping on dopant diffusion and clustering
- High-tilt implants for halo formation and gate/SDE overlap
- Physical modeling of defects, dopant activation, and diffusion in Si, Ge, SiGe, and SOI: ab initio, molecular dynamics, Monte Carlo, continuum TCAD, and stochastic extensions
- Characterization of 1D, 2D, and 3D dopant profiles: SCM, nano-SRP, SIMS, LEAP, SSRM, XPS, etc.
- Dependence of electrical device characteristics (e.g., leakage, short channel effects, threshold voltage, electrical activation, and statistical fluctuations) on the dopant-defect interactions, the interactions with interfaces, and other front-end processing phenomena listed above
- Alternative devices enabled by sub-second advanced rapid thermal annealing

Invited speakers include (partial list): **K. Adachi** (Toshiba), **F. Cristiano** (CNRS, France), **R. Duffy** (Philips Research Leuven, Belgium), **Victor Moroz** (Synopsys), **S. Severi** (IMEC, Belgium), **A. Shima** (Hitachi, Japan), **S. Talwar** (Ultratech Stepper), **Paul Timans** (Mattson), and **T. Yamamoto** (Fujitsu, Japan).

Symposium Organizers

Kevin S. Jones
University of Florida, SWAMP Center, Dept. of Materials Science & Engineering
Gainesville, FL 32611
Tel 352-392-9872, Fax 352-392-8381, kjones@eng.ufl.edu

Masami Hane
NEC Corporation, System Devices Research Laboratories
1120 Shimokuzawa, Sagamihara 229-1198, Japan
Tel 81-42-771-0797, Fax 81-42-771-0886, hane@az.jp.nec.com

Susan B. Felch
Applied Materials Inc., MS 81280, 974 E. Arques Ave., Sunnyvale, CA 94086
Tel 408-584-1273, Fax 408-584-1194, susan_felch@amat.com

Bartek J. Pawlak
Philips Research Leuven, Kapeldreef 75, B-3001 Leuven, Belgium
Tel 32-16-281060, Fax 32-16-281706, bartek.pawlak@philips.com

Mitchell C. Taylor
Intel Corporation, RA3-301, 5200 NE Elam Young Pkwy. Hillsboro, OR 97124
Tel 503-613-6018, Fax 503-613-5967, mitchell.taylor@intel.com

For additional meeting information, visit the MRS Web site at www.mrs.org/meetings/ or contact:

Member Services
Materials Research Society
506 Keystone Drive, Warrendale, PA 15086-7573 • Tel 724-779-3003 • Fax 724-779-8313 • info@mrs.org