Postdoctoral Research Applicant (Materials Science)

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PROFILE:

- Highly self-motivated Ph.D. candidate with demonstrated research expertise growing semiconductor nanostructures. Strong interpersonal skills
- Experimental techniques: e-gun evaporation, molecular beam epitaxy (MBE)
- Rich experience in modeling and computer simulation, using MatLab, FlexPDE, Mathematica, and PSPICE Additonal experience in digital circuit design using VHDL
- Computer skills: Unix/Linux/Windows; HTML, LaTeX; C/C++, etc.

EDUCATION:

Duke University, Durham, NC (GPA: 4.0/4.0)
Ph.D. Materials Science, June 2007 (expected)
M.S. Materials Science, 2005

Tsinghua University, Beijing, P.R. China (GPA: 3.8/4.0)
B.S. Materials Science and Engineering, 2002
Graduated with honors, 2002; First degree fellowship, 1998-2002

RESEARCH INTERESTS:

- Semiconductor process engineering
- Modeling and simulation of semiconductor processes
- Reliability study and failure analysis
- Electronic packaging

ENGINEERING RESEARCH EXPERIENCE:

Duke University, Durham, NC
Ph.D. Candidate, 2002-present

• *Nanowire growth*

Proposed a model determining the obtainable minimum size of nanowires (NWs) grown by vapor-liquid-solid (VLS) process, one of the most important methods for growing semiconductor nanostructures. Revived the study on VLS mechanisms, and spurred a flurry of papers on the thermodynamic and kinetic analysis of the process. Derived the growth rate formula, for the first time in the literature, using all physically meaningful quantities without empirical fitting factors. Established a novel growth model by assuming a two-dimensional island nucleation-growth process, which is, to the best of my knowledge, currently the only model that can fit an extensive set of growth rate data on Si whiskers/nanowires.

• *Diffusion and gettering*

Explained how volume misfits between the metal precipitates and Si drastically prolongs the time needed for Al gettering of solar cell Si. Proposed methods to effectively reduce the gettering time in the presence of metal precipitates. Demonstrated that optical-assisted Al gettering process can reduce Al gettering time from tens of hours to several minutes. Contributed to the understanding of the predominance of alternate diffusion mechanisms for the interstitial-substitutional impurities in Si. (Above projects are financially supported by National Renewable Energy Laboratory (NREL)).

Max-Plank-Institute for Microstructure Physics, Halle, Germany,
Visiting Scientist, Oct-Dec 2005

• *Nanowire morphology—chemical tension*

Formulated a model for describing the morphology of the growing nanowire, from the beginning of growth to either a steadily growing wire with a constant diameter or a hillock for which the growth process terminates. Included, for the first time in the literature, a *dynamic* chemical tension in analyzing the system equilibrium configuration, in addition to the normally considered *static* physical tensions.