

Dmitry A. Kozak

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PURPOSE: Seeking R&D position in the field of MEMS/NEMS/MOEMS, nanotechnology and microfabrication.

EDUCATION:

- University of California, Santa Cruz
PhD in Electrical Engineering, June 2012
Thesis title: MEMS based optical filters in MWIR vision, adviser: Dr. Joel Kubby
- University of California, Davis
BS in Electrical Engineering, June 2005
Concentration in device physics, microfabrication and vacuum electronics, adviser: Dr. Hunt

SPECIALTY/CONCENTRATION:

- Experience in design, development, FEA simulations, hands-on micro- and nano-fabrication and testing of MEMS and NEMS devices.
- Optical design of Fabry-Perot and Lamellar grating filters in MWIR (3-7 um), design, fabrication and optical testing verification of Bragg stack reflective films for MWIR and LWIR.
- Growth and characterization of carbon nano-fibers (CNF/CNT), both arrays and individual, for use in NEMS device.
- Design, fabrication and testing of microfluidic devices.

MICROFABRICATION:

- Photolithography development for optimized resolution and reduction of line edge roughness.
- Electron-beam lithography for nanometer-sized feature definition.
- Thin film deposition using CVD, PECVD, evaporation and sputtering, including dielectrics, semiconductor materials, metals and polymers.
- Evaluation of thin films using SEM, XPS, Raman spectroscopy, evaluation of defects for mechanical, electrical and optical performance, and optimization of deposition parameters.
- Dry and wet etching of semiconductors, dielectrics and metals, evaluation and optimization of processes for defect reduction and optimization of process flow.

LABORATORY SKILLS:

- Evaluation and testing of MEMS devices using microprobe station, including voltage/deflection testing and evaluation of fabrication yield.
- Evaluation of devices and films using white-light interferometry for detection of mechanical and optical qualities.
- Design, construction, maintenance and improvement of PECVD chambers for CNF growth. Design, construction and maintenance of vacuum chambers (up to UHV) for testing of vacuum microelectronics.

SOFTWARE:

Finite element analysis: IntelliSuite, ADINA

Design and layout: L-Edit, AutoCAD

Visualization: SolidWorks, Google Sketch-Up

Mathematical modeling: MATLAB, Mathematica

Equipment control: LabView, Visual C++

Programming languages: Proficiency in C++, familiarity with Java, Perl, assembly, HTML

Operating systems: Windows (95-7), Unix, Linux, Mac OS, Solaris

Document/Communication: Microsoft Word, Excel, PowerPoint

EMPLOYMENT HISTORY:

September 2005 – present:

Graduate student researcher at UC Santa Cruz, MEMS group.

- Involvement in multiple projects, both as lead researcher and support positions, for multiple MEMS devices.
- Assisting faculty in managing undergraduate and graduate level MEMS design classes, in helping groups of students understand, design and test MEMS devices.
- Helped other group members in writing computer interfaces using Visual C++ and LabView for microscopy projects.
- Group safety supervisor, responsible for laboratory safety, coordination with EH&S, and maintenance of safe working environment
- Teaching assistant for courses: beginning analog design; advanced analog design; materials science and engineering; device physics; starting new technology company.

Microfluidics project:

- Initial design of microfluidics device for energy generation.
- Coordination with foundry (phone, e-mail, in-person visits) to modify design and process to achieve the optimal performance.
- Fluidics testing of test structures and devices.
- Supervision of several groups of students in design of various microfluidic devices.
- Fabricating of molds for the designs.

April 2011-present

Contractor for EPIR Technologies, Inc.

Main project: Design, fabrication and testing of Fabry-Perot optical filter in the MWIR.

- Analysis of the existing filter technology for use in MWIR
- Development of a unique design that included Bragg stacks as reflective material and SOI wafers as substrate
- Optical design and simulation, in MATLAB, of optical behavior of Bragg stacks consisting of germanium and silicon oxide, and their interaction with substrate silicon.
- Deposition of Bragg stacks using PECVD and e-beam evaporator, with process variations designed to minimize stress
- Optical testing of the Bragg stacks and verification of optical properties
- Thin-film stress measurement
- Matrix of experiments using several etching methods to determine the optimal combination of steps (accounting for defects, surface roughness, yield)
- Achieved a process that is scalable to large wafer size, uses the least number of steps, and produces high yield
- Mechanical and optical testing of the device
- Quarterly progress reports to funding agencies to maintain funding
- Assistance with proposal writing

Secondary project: Lamellar grating filter in the MWIR.

- Design of Lamellar grating filter that uses Fourier analysis to provide spectral filtering.
- FEA simulations of the Lamellar grating based on comb-drive actuator.
- Determination of trade-offs for chemical polishing of gratings following DRIE to optimize the optical performance and reduce cost
- Fabrication of the device on SOI wafers
- Mechanical testing of the device.

June 2006 – January 2009

Graduate researcher at NASA Ames, nanotechnology group.

Main project: Design and fabrication of CNF-based NEMS switch.

- Concept development and analysis
- FEA simulation of mechanical behavior of carbon nano-fibers (CNFs)
- Process development for integration of CNF into CMOS-compatible process, including mask design and fabrication, material selection, and deposition/etching steps consideration
- Patterning of CNF catalyst using e-beam lithography.
- Deposition of insulating layers and electrodes (dielectric and metals) using PECVD and evaporation
- Optimization of etching using wet and dry etching, with defect minimization and yield improvement
- Growth of CNFs from catalyst metal films and polymer-based nanoparticles using DC and RF PECVD, with DOE development of the growth parameter variation and effect on the CNF mechanical properties
- CNF characterization using Raman, SEM and XPS
- Maintenance, design and modification of PECVD chambers for CNF growth
- Presentation of work at several agency, center and international conferences
- Assistance to other members of the group with photolithography mask design, photolithography and e-beam lithography on other nanotechnology related projects.

January 2004-April 2005

Undergraduate student researcher at University of California, Davis, vacuum microelectronics group

- Vacuum system design, construction and maintenance (mid to ultra-high)
- Plasma system maintenance
- Plasma bombardment of carbon materials to achieve formation of nanostructures
- Technical literature translation (Russian to English)

PUBLICATIONS:

Three journal publications in process.

INTERNATIONAL CONFERENCE PRESENTATIONS:

- SPIE Photonics West, 2012. Oral presentation of paper “*Sidewall Roughness reduction Techniques for MOEMS following DRIE*”.
- SPIE Photonics West, 2011. Oral presentation of paper “*Fabrication and testing of a MEMS-based optical filter combined with a HgCdTe detector*”.
- SPIE Photonics West, 2010. Oral presentation of paper “*Prototyping of MWIR MEMS-based optical filter combined with HgCdTe detector*”.
- MRS Spring meeting, 2008. Oral presentation of paper “*Wafer-scale fabrication of a vertically-aligned NEMS switch based on carbon nanofibers*”.

LANGUAGE FLUENCY:

English, Ukrainian, Russian.

References available upon request