ADVENT Diamond

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MANPUNEET KAUR BENIPAL

EDUCATION & TRAINING

ARIZONA STATE UNIVERSITY, ENGINEERING OF MATTER, TRANSPORT & ENERGY — **Tempe, AZ**
Doctorate of Philosophy in Materials Science and Engineering — May '16

ARIZONA STATE UNIVERSITY, DEPARTMENT OF PHYSICS — **Tempe, AZ**
Professional Science Masters in Nanoscience — Dec. '10

GURU NANAK DEV UNIVERSITY — **Amritsar, India**
Masters of Science in Nanotechnology — June '08

PANJAB UNIVERSITY — **Chandigarh, India**
Bachelors of Science in Physics, Chemistry, & Mathematics — June '06

RESEARCH & EXPERIENCE

ADVENT DIAMOND, LLC — **Scottsdale, Arizona**
Co-Founder — June '16-present

- Develop 3rd generation diamond devices that outperform the existing solid-state devices.
- Outline and evolve the technical roadmap and research the market for diamond devices commercialization.
- Raise money to accomplish the milestones on technical roadmap and to execute the commercialization plan.

ASM AMERICA — **Tempe, Arizona**
Senior Process Engineer I, Memory Devices — July '16-Present

- Develop thin film metal oxide processes using atomic layer deposition for semiconductor companies and foundries around the globe for memory devices.
- Understand the business aspects, and provide technical assistance and problem solving that involves critical thinking to improve the quality of ALD metal oxide films for various applications in memory devices and satisfy customer requirements**.**
- Co-ordinate projects among different groups at ASM America and the worldwide locations of ASM International.

ARIZONA STATE UNIVERSITY — **Tempe, Arizona**
Research Specialist — July '16-Present

- Leading device fabrication and characterization for Office of Naval Research project to make diamond emission diodes for high power electron beams in collaboration with the Johns Hopkins University Applied Physics Laboratory.
- Conceptualize and process the diamond PIN design for emission diodes and characterization processes.
- Mentoring an undergrad student to improve device fabrication process for diamond proton detector.
- Developing ARPA-E cost model for diamond PIN diodes and BJTs.
- Provided insight to improve the design of PEALD system for metal oxides and metal fluorides to enhance the process efficiency.

ARIZONA STATE UNIVERSITY — **Tempe, Arizona**
Research Assistant, Advisor – Dr. Robert Nemanich (former IU-MRS President) — Aug '12 – May '16

- Enabled and optimized remote Plasma Enhanced Atomic Layer Deposition (PEALD) and molecular beam deposition (MBD) to develop metal oxide processes for uniform and conformal metal oxide thin films for TFTs, photochemical reactions and passivation applications.
- Extensively used PEALD, MBD, XPS, UPS, AFM, PFM, RBS, XRD and XRR, e-beam, hall measurements, four point probe and clean room, and maintained and troubleshooted ultra high vacuum deposition and characterization systems.
- Collaborated with materials scientists, physicists and electrical engineers to understand the effect of interfaces and materials properties on electrical and photocatalytic properties of heterostructures.
- Studied PEALD ZnO thin films on periodically poled lithium niobate (PPLN) using photoinduced Ag nanoparticle deposition pattern, which enhanced surface photoreduction reactions.
- Mentored undergraduate and graduate students with their research projects and trained for vacuum deposition and characterization systems.

AMBATURE LLC - MATERIALS AND PROCESS DEVELOPMENT DEPARTMENT **Tempe, Arizona**
Research Engineer, Supervisor – Dr. John Sanchez & Dr. Yong Liang Jan ’11 – March ’12

- Fabricated high quality superconducting thin films using pulsed laser and sputter system. Regularly discussed with R&D group to manipulate the deposition conditions, and referred to literature and characterization results that improved the thin films superconducting properties.
- Routinely performed AFM and XRD for detailed study of surface morphology, grain size and roughness and to determine thin film crystal alignment, respectively, which allowed to determining the thin films quality.
- Characterized thin films using four probe system to determine the R(T) behavior, which is the key characterization to determine the superconducting nature of thin films
- Managed projects in collaboration with outside companies, provided detailed insight of the projects, and presented the collected and analyzed data to R&D group.

ARIZONA STATE UNIVERSITY **Tempe, Arizona**
Research Assistant, Advisor – Dr. Robert Nemanich (former IU-MRS President) May ’10 – Dec ’10
Project: Metal Insulator Transition (MIT) of VO2 under the Influence of Electric Field and VO_2 tunnel structure for charge storage.

- Collaborated with team and worked independently to establish the metal insulator transition [MIT] of VO2 under the influence of electric field, and designed and characterized VO_2 tunnel structure sandwiched SiO_2 and HfO_2 for charge storage.
- Strived for quality while applying knowledge and experience on e-beam and molecular beam deposition to optimize deposition process of oxides and metals, which resulted in the control of metal oxide oxidation state and the formation of ohmic contacts.
- Utilized XPS to characterize the as deposited and plasma treated metal oxides to analyze the quality of thin films before making devices.

Project: Gold Islands on Silicon Substrate, Advisor – Dr. Peter Bennett Jan ’10 – May ’10

- Used UHV e-beam system and AFM (Veeco Dimensions 3000) while examining the variation of shape, size and density of gold islands that are used a catalysts to form nanowire.

SELECTED PUBLICATIONS

“Photochemical Reaction Patterns on Heterostructures of ZnO on Periodically Polled Lithium Niobate” M. Kaur, Q. Liu, P. Crozier and R. J. Nemanich; *ACS Appl. Mat. Interfaces (accepted September 2016).*

“Electron Affinity of Cubic Boron Nitride Terminated with Vanadium Oxide” Y. Yang, T. Sun, J. Shammas, M. Kaur, M. Hao, R. J. Nemanich, *J. Appl. Phys.* **118**, 165310 (2015).

“Characterization of plasma-enhanced atomic layer deposition of Al2O3 using dimethylaluminum isopropoxide” J. Yang, B.S. Eller, M. Kaur, and R.J. Nemanich, *J. Vac. Sci. Tech. A* **32**, 021514 (2014).

“Band Alignment of Vanadium Oxide as an Interlayer in a Hafnium Oxide-Silicon Gate Stack Structure ” C. Zhu, M. Kaur, F. Tang, X. Liu, D. J. Smith and R. J. Nemanich, *J. Appl. Phys.* **112**, 084105 (2012).

SYNERGISTIC ACTIVITIES

ASU SUNDIAL **Tempe, Arizona**
Mentor/Career Panel Member Aug ’14 – present

- Mentored undergraduate student to get them familiar with research and accomplish their research goals, which included technical assistance and ultra-high vacuum tool and characterization techniques. Organized lab tours for undergraduate and graduate student to provide an overview of experimental work. In addition, to give back to the society, availed an opportunity to serve as a member of career panel to enlighten STEM students for career opportunities.

SCIENCE FOUNDATION OF ARIZONA **Tempe, Arizona**
Fellow Aug ’10 – Aug ’12

- Designed and executed after-school science program for 6th-8th graders on alternative energy at Akimel-a Middle School. Researched educational methods from which to create lesson plans, design experiments, and organize demos appropriate to explain complex scientific problems at an elementary level. Implemented the lesson plans and instructed students to achieve the learning objectives. Critiqued and evaluated the effectiveness of the learning module.

ARIZONA STATE UNIVERSITY **Tempe, Arizona**
Teaching Assistant Oct ’09 – Jul ’10

- Analyzed, adapted and taught lab theory, principles, and procedures to physics students.
- Worked with colleagues to set up best practices in performing experiments for students.