Proposal for a short-term internship program of Uzbek young scientists at the University of Texas at Dallas

Suggested research topics

1. Faculty of Chemstry and Alan MacDiarmid Nanotech Institute at University of Texas at Dallas (UTD)

Location (campus): Berkner Hall, campus of UTD at 800 W.Campbell street, Richardson

Scientific supervisor: Prof. Anvar Zakhidov, Deputy Director NanoTech Institute

No.	Program name	Maximum number of participants	Internship period	Program details (what will young scientists learn from the program)
1	Synthesis of Carbon Nanotubes (CNT) forests by CVD process for applications in advanced energy conversion and storage devices	Two grad students	6 months for each student	Young researchers will learn all the steps of synthesis of unique Carbon Nanotubes (CNT) forest on Si substrate, coated by Fe nanocatalyst film, using electron beam deposition in the Clean room of UTD. They will be trained to work in Clean Room and to perform SEM imaging of CNT
2	Design and Fabrication of a)Energy harvesting CNT yarns and b) charge collecting electrodes for Perovskite Solar cells	Two grad students: One for Task a) One for Task b)	6 months for each student	Young researchers will learn all the steps of processing of drawable unique Carbon Nanotubes (CNT) twisted yarns and sheets in the wet lab of NanoTech Institute and in Clean room of UTD. They will be trained to work in Chemical lab and to perform many types of testing CNT energy harvesting devices, such as Twistrons and Artificial Muscles made from CNT yarns and sheets
3.	a) Fabrication of Perovskite Light emitting devices, LED in multichamber Vacuum Deposition system. b) synthesis of Perovskite Quantum Dots for Luminescent Solar	Two grad students total: One for Task a) One for Task b)	6 months for each student	Young researchers will learn all the how to create perovskite LEDs and test those devices in advanced nanofabrication lab. They will also get experience on synthesis of colloidal quantum dots by hot injection method. They will be trained to work in Clean Room and to perform SEM imaging of CNT

	Concentrators for transparent Solar Windows			

2. **Faculty Materials Science and Engineering**

Location (campus): Berkner Hall, campus of UTD at 800 W.Campbell street, Richardson

Scientific supervisor: Prof. Manuel Quevedo, Ph.D. in Materials Science, Head of MS&E Department

No.	Program name	Maximum number of participants	Internship period	Program details (what will young scientists learn from the program)
1	CHESS: Center of Harsh semiconductor systems	Two grad students	Two students total: One for Task 1 and one for Task 2 6 months for one student	1) Oxide thin films materials for non-volatile memory. This project explores conventional and non-conventional oxide integration and testing schemes for non-volatile memory for high temperature applications. Previous protypes have used simple fabrication methods (such as shadow mask and pillar device structure) to reduce the total number of lithographic steps in memory devices. While this is useful for increasing the frequency of design iterations, these prototypes are not immediately compatible with patterned top electrodes as needed for heterogeneous integration and new integration schemes are required. Students in this project will learn about thin film depositions and device fabrication. Student with Materials Science, Physics and EE are preferred. This project is partially sponsored by CERFE labs. 2) Thin Film Radiation Sensors. This project explores conventional and non-conventional thin films for radiation sensors, particularly for X-ray, UV and gamma radiation. This project will investigate the materials science that that govern interaction of neutrons, x- and gamma-rays with thin films semiconductor systems to enable high efficiency, low-cost, detection devices. Currently, the primary limitation of these systems is long-term operational stability. On the other

				hand, these systems possess excellent charge-carrying capacity (long diffusion lengths of charge carriers, high mobility, and low trap density), which makes ideal for semiconductor radiation detectors and further improves sensitivity. Students in this research projects will be exposed and learn about thin film processes, radiation testing protocols and device fabrication. Student with Materials Science, Physics and EE are preferred. This project is partially sponsored by EMP Technologies.
2	CHESS: Center of Harsh semiconductor systems		6 months for one student	1) Single Photon Detectors: This project explores transparent superconductive oxides (TSC) for infrared single photon detectors. We propose the development of novel superconducting nanowire single-photon detectors (SNSPDs) for highly efficient, wide bandwidth SNSPDs. The proposed TSCs have large optical band gap and a plasmonic edge in infrared, thus eliminating undesirable interaction of a single photon with free electrons that do not contribute to the SC state. Students will use pulsed laser deposition and sputtering methods to deposit TSCs and support optical and electrical characterization of the resulting materials. Student with Materials Science, Physics and EE are preferred. This project is partially sponsored by NASA.
3	CHESS: Center of Harsh semiconductor systems		6 months for one student	1) Radiation Damage in Semiconductor Perovskites: Perovskites have played a crucial role in several applications. In this project, we propose to investigate the degradation mechanisms of halide perovskite films as function of ionizing radiation and energy. To achieve this, students will use a combination of theoretical simulations and in-situ characterization to clarify the damage caused to thin films of perovskite by subjecting these materials to different sources

				of ionizing radiation and correlate its composition with the damage caused by the different sources of ionizing radiation. Students in this research projects will be exposed and learn about thin film processes, radiation testing protocols and device fabrication. Student with Materials Science, Physics and EE are preferred. This project is partially sponsored by DHS.

3. Department of Physics and Department of Chemistry and Biochemistry at University of Texas at Dallas (UTD)

Location (campus): Sciences Building, campus of UTD at 800 W. Campbell Road, Richardson

Scientific supervisor: Prof. G. Andrés Cisneros, Department Head and Professor of Physics, Professor of Chemistry and Biochemistry

No.	Program name	Maximum number of participants	Internship period	Program details (what will young scientists learn from the program)
1	Computational Characterization of Disease Mutation in DNA Transaction Proteins	One grad student	6 months	Young researchers will learn the theory and application of all atom biomolecular simulations using classical potentials, and molecular dynamics techniques to characterize the impact of a cancer-associated mutation on a DNA transaction protein.