Opportunity Title: Study of Exciton Condensation in Transition Metal Dichalcogenides and their Heterostructures
Opportunity Reference Code: ARL-C-SEDD-300052

Organization DEVCOM Army Research Laboratory

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Description **About the Research**

The U.S. Army Research Laboratory (ARL) seeks a highly motivated, well informed, cross-disciplinary, and skilled research associate with experience in 2D materials exciton research to design and development excitonic devices. The main objective of this project is to study excitons in TMD monolayers heterostructures and explore their condensed phases. The students is expected be research the quantum material properties of exciton condensates and develop basic device concepts. The candidates with a strong background in 2D materials research with expertise in growth and processing of these materials is desired. ARL is accelerating a strategic initiative to move the physics of quantum materials to the engineer emerging devices that may solve future battlefield challenges and equivalently may advance related civilian technology. Recent experiments demonstrate that excitons in 2D materials with high binding energies can form and maintain quantum correlation at near room temperature. This can open a new opportunity for development of materials with unique physical properties for military applications. This fellowship is a unique opportunity to take full advantage of ARL's strategic intra-extramural reach with a seamless collaboration among ARL laboratories, extended campuses and leading academic scientists.

Keywords: 2D excitons, 2D heterostructures, Exciton condensates, quantum materials, 2D optoelectronic devices.

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About SEDD

The Sensors and Electron Devices Directorate (SEDD) is the Army's principal center for research and development in the exploration and exploitation of the electromagnetic spectrum, which includes radio frequency, microwave, millimeter-wave, infrared (IR), visible, and audio regions. SEDD is responsible for advances in laser sources, RF sources, IR sensors, signature detection and decoding, target imaging and its interpretation, fusion of data derived from several sensors, and electromagnetic protection.

In addition, SEDD is responsible for improving the technology base for electron devices and materials related to sensors and power devices. Research is conducted in related aspects of physics, electrical engineering, computer science, solid-state physics, chemical engineering, material sciences, and electrochemistry.

About ARL-RAP

The Army Research Laboratory Research Associateship Program (ARL-RAP) is designed to significantly increase the involvement of creative and

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highly trained scientists and engineers from academia and industry in scientific and technical areas of interest and relevance to the Army. Scientists and Engineers at the CCDC Army Research Laboratory (ARL) help shape and execute the Army's program for meeting the challenge of developing technologies that will support Army forces in meeting future operational needs by pursuing scientific research and technological developments in diverse fields such as: applied mathematics, atmospheric characterization, simulation and human modeling, digital/optical signal processing, nanotechnology, material science and technology, multifunctional technology, combustion processes, propulsion and flight physics, communication and networking, and computational and information sciences.

A complete application includes:

- **Curriculum Vitae or Resume**
- **Three References Forms**
  - An email with a link to the reference form will be available in Zintellect to the applicant upon completion of the on-line application. Please send this email to persons you have selected to complete a reference.
  - References should be from persons familiar with your educational and professional qualifications (include your thesis or dissertation advisor, if applicable)
- **Transcripts**
  - Transcript verifying receipt of degree must be submitted with the application. Student/unofficial copy is acceptable

If selected by an advisor the participant will also be required to write a **research proposal** to submit to the ARL-RAP review panel for :

- Research topic should relate to a specific opportunity at ARL (see Research Areas)
- The objective of the research topic should be clear and have a defined outcome
- Explain the direction you plan to pursue
- Include expected period for completing the study
- Include a brief background such as preparation and motivation for the research
- References of published efforts may be used to improve the proposal

A link to upload the proposal will be provided to the applicant once the advisor has made their selection.

Questions about this opportunity? Please email ARLFellowship@orau.org

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Academic Level(s):** Any academic level.
- **Discipline(s):**

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- **Physics** (16 👁)
- **Age:** Must be 18 years of age