

DAGSI Research Topic Proposal

1. **Research Title:** *Synthesis and Device Characterization of 2-Dimensional Materials*

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Electrical Engineering/ Nanoelectronic Materials/ M.S. level

4. **Objectives:** Synthesis and electrical characterization of 2-dimensional materials (e.g., WS₂ and MoS₂) for devices with tunable electronic properties for ultra-compact high-performance electronics and sensors.

5. **Description** Two-dimensional (2D) materials (e.g., MoS₂, WS₂, etc.) provide a combination of wide band gap and large carrier mobilities which addresses the US Air Force need for high power and high frequency, agile RF devices. In addition, the AF has a need for large scale, conformable electronics. Conventional semiconductors, such as gallium arsenide, doped gallium nitride, and silicon germanium are mechanically rigid and based on a high temperature process, limiting their incorporation with flexible and strainable substrates. 2D films of WS₂, MoS₂, and heterostructures have a mobility greater than 400 cm²/Vs, and can be processed at low temperatures using methods such as metal organic chemical vapor deposition (MOCVD) on various flexible substrates. Electrical characterization is also imperative to ensure optimum device performance of these 2D materials on flexible substrates. Direct growth of large scale 2D materials, at low temperatures on flexible substrates will allow use of these materials in conformal electronic devices.

6. **Research Classification/Restrictions:** Not classified. Not restricted.

7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided.

DAGSI (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati)
PA Approval #: 88ABW-2013-3021

AFIT (only)

USAFA (only)

If you are submitting a topic for the USAFA, please indicate if you are also interested in sponsoring a USAF Cadet in summer of 2015 (Avg Cost for USAF Cadet for 33 days was \$5000)

Yes No

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