

**Research Title:** Synthesis of 2D Material Systems for Electronics and Sensing

**Individual Sponsor:**

Dr. Nicholas Glavin, AFRL/RXAS  
2179 12<sup>th</sup> St.  
WPAFB, OH 45433  
[Nicholas.glavin.1@us.af.mil](mailto:Nicholas.glavin.1@us.af.mil)  
(937) 255-6977

**Academic Area/Field and Education Level**

Materials Science and Engineering, Chemistry, Physics, or equivalent (MS or PhD level)

**Objectives:** Develop synthesis approaches for 2D materials targeted at creating robust and reliable sensors for human performance monitoring and augmentation.

**Description:** Ultra-thin semiconducting materials with bandgap energies corresponding to visible light are uniquely suited for molecular sensing as they possess a high surface to volume ratio and demonstrate strong electronic and optical responses to low density molecular absorption events in a convenient optical range. These materials are also mechanically flexible, enabling integration of thin, semiconducting transducers into unobtrusive, wearable sensors. We are especially interested in proposals incorporating novel techniques for direct, large area synthesis on flexible substrates with no transfer steps needed to realize macroscopic sensor devices and arrays. Approaches for controlling defect density in the 2D materials to compare to sensitivity and post-functionalization selectivity would be of strong interest as well. Functionalization approaches for selectivity may include non-covalent attachment of complex molecules to the transducer resulting in selective binding or by limiting molecular access to the transducer based on molecular size via a covalent organic framework. Demonstration of sensing applications for exposure to hazardous chemicals or biomolecules related to healthcare and human performance would be expected results from the proposed work.

**Research Classification/Restrictions:** Unclassified, unrestricted.

**Eligible Research Institutions:** All U.S. institutions with graduation programs in the relevant academic areas listed above. Coordination with the topic sponsor is encouraged prior to proposal submission.