RX15-19

1. **Research Title:** Carbon based optoelectronics and electronics
2. **Individual Sponsor:** List the AFRL research topic sponsor's contact information

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3. **Academic Area/Field and Education Level**

Electrical Engineering, Materials Science and Engineering, Physics (MS or Ph.D. level)

4. **Objectives:** Research and develop optoelectronic and electronic device concepts based on carbon materials (e.g., graphene, carbon nanotubes, fullerenes). Research areas include: (a) carbon material synthesis and preparation; (b) device and test structure fabrication; (c) measurements of optical and electrical properties; and (d) modeling of electronic and optical properties.
5. **Description:** Carbon materials are unique in terms of the rich variety of allotropes (e.g., graphene, carbon nanotubes, fullerenes) in the material family and they have been studied extensively in the Materials and Manufacturing Directorate at AFRL. From the perspectives of optoelectronics and electronics, carbon materials have great potentials (e.g., high mobility, low cost, and large area) but have yet made substantial impacts due to different reasons. Therefore, in this topic, we will look into novel ways of utilizing carbon materials for optoelectronic and electronic applications such as infrared sensing, RF electronics, and solar energy harvest. One example is that we will apply a novel physical concept, namely plasmonics, on graphene and carbon nanotubes to investigate its potential in infrared sensing. Another route is to carefully design carbon heterostructures to tailor the optical absorption by mixing various carbon allotropes. The goal of this project is to generate innovative concepts on carbon based optoelectronics and electronics for the interests of AF and DoD. Key issues to be addressed are (1) carbon material system design and preparation, (2) test structure/device fabrication and characterization, and (3) correlation of materials properties to device performance.
6. **Research Classification/Restrictions:** This research has no ITAR restrictions
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) NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval # 88ABW-2013-3428