

## AFRL RESEARCH TOPIC CALL FOR FY19

1. **Research Title:** Tissue-Integrated Optical Sensor Platforms
2. **Individual Sponsor:**  
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3. **Academic Area/Field and Education Level:** Chemistry, Materials Science & Engineering, Chemical Engineering, or related fields (MS or Ph.D. Level).
4. **Objectives:** Develop a better understanding of the structure-property-processing relationships which impact the performance and biocompatibility of chromophore-based oxygen microsensors embedded in injectable tissue-scaffolds.
5. **Description:** Understanding and mitigating Unexplained Physiological Events (UPEs) in High Altitude Flight represents a primary concern of the Air Force Medical Service. Reliable physiological sensors that measure oxygenation levels, among other physiological vitals, for root-cause analysis and early-detection of adverse events are required because many clinical technologies do not function properly in this environment. Novel soft, injectable oxygen microsensors likely have enormous potential to non-invasively report on tissue hypoxia when coupled with external optical 'readers.' AFRL/RX has been working to better understand the photophysical characteristics, biocompatibility and tissue-integration, injectability, and biodegradable nature of these sensor platforms to improve and tune their performance. These sensors are not biodegradable currently and remain in the body indefinitely after injection under the skin; therefore, a biodegradable sensor platform is desired to improve user perception and allow for more widespread adoption. In addition, a thorough understanding of the scaffold and in vivo environmental effects on the aggregation and lifetime characteristics of dye-based oxygen sensors is needed. This knowledge will drive towards capability to design and synthesize high performance tissue-integrated oxygen sensors which can be programmed to biodegrade at predetermined time intervals.
6. **Research Classification/Restrictions:** This opportunity is unclassified and open to US citizens only. Proprietary information discussed when working with industry collaborators cannot be disclosed, and appropriate agreements will be in place before research begins. AFRL will provide appropriate guidance on public release and disclosure agreements.
7. **Interest in Summer USAFA Cadet:** No.
8. **Eligible Research Institutions:** Place an X in all that apply.

X Universities (DAGSI)      AFIT (only)      USAFA