RH19-4

AFRL CALL FOR RESEARCH

1. **Research Title:** Biomolecular Interactions of Advanced, Nanostructured Materials

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Chemical, Biological Sciences and/or Materials Engineering (MS or Ph.D. level)

4. **Objectives:** General Specific investigation objectives include:

   - Development of accurate exposure mechanisms for advanced/nano materials – at the air-liquid interface, under dynamic flow.
   - Characterize advanced/nano materials under biologically accurate conditions, including evaluation of physical properties as well as material uptake and translocation into various parts of cells.
   - Identify the molecular events involved in material/nano interactions, including membrane receptor binding, deposition, and subsequent biological responses.

5. **Description:** Engineered advanced materials and nanomaterials (NM) possess novel physical and chemical properties and are being explored for the creation of unique nanoscale devices. The distinctive quantum characteristics of advanced/nano materials confer novel physico-chemical properties to create electrical, optical and magnetic attributes, which are not present in the corresponding bulk materials. These prepared materials are useful for military applications such as sensitive, rapid, and portable battlefield remote monitoring devices which can aid in the detection of a variety of analytes. Physical parameters of synthesized nanoparticles can affect these attributes and influence biological interactions such as uptake in cells and induction of cellular responses. However, it remains unclear how different properties, such as size, structure, shape and geometries, interact with cells, their components, or produce downstream molecular events such as cytotoxicity, stress, and signaling activation. Moreover, previous results have demonstrated that mechanism of exposure influences nanomaterial behavior and cellular response. The main focus of this research is to elucidate the mechanism of nanomaterial interactions with biological systems, under advanced and accurate exposure scenarios, in order to provide fundamental knowledge for the creation of molecular devices and to ensure that there are no risks associated with these materials.

6. **Research Classification/Restrictions:** *NA*

7. **Eligible Research Institutions:**

   X Universities (DAGSI) ☐ AFIT (only)

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8. **Potential Commercial Impact and Industry Involvement:** The success of this project will lead to the development of nano-devices including bio-sensors that will have commercial value.

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