

AFRL RESEARCH TOPIC CALL FOR FY14

ATTACHMENT 1

1. **Research Title:** "Mid-IR Plasmonic Materials and Structures"
2. **Individual Sponsor:**
Dr. Justin Cleary, AFRL/RVDH
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3. **Academic Area/Field and Education Level:** Electro-Optics, Optical Engineering or Engineering Physics (MS or Ph.D. level)
4. **Objectives:** The optical excitation of surface plasmons at conductor / dielectric interfaces has recently been expanded to the mid- and long-wave infrared (5-12 μm). At these wavelengths, loss is minimized, the active control of plasmon modes becomes possible, and new research opportunities arise in regard to both components and material research. Noble metals are known to operate at these wavelengths but are known to have very weak mode confinements. New materials and structures offer potential use as long wavelength plasmon hosts based not only on tight-mode confinement, but also control of electrical and optical properties based on stoichiometry, offering new on-chip optoelectronic possibilities.
5. **Description:** The investigation of material systems with plasma frequencies in the IR (conductive ZnO, doped group IV's) and plasmon based components (gratings, periodic hole arrays, or other structures) at longer wavelengths forms the basis of this undertaking. The concept is that materials with plasma frequencies in the near or even mid-IR will enable plasmonics with tightly confined modes at the wavelengths of interest for novel on-chip optoelectronics. A key component will be developing plasmonic structured surfaces for high-efficiency in-coupling.
6. **Research Classification/Restrictions:** The research performed on this project is anticipated to be fundamental in nature, with no inherent publication or presentation restrictions.
7. **Eligible Research Institutions:** Place an X in all that apply.
 Universities (DAGSI) AFIT (only) USAFA
8. **Interest in Summer USAFA Cadet (Avg Cost for USAF Cadet for 33 days was \$5000):**
If we have the funds, yes.
9. **Qualifications:** Graduate student. Experience of photolithography techniques of semiconductor structures and/or infrared plasmonics is an advantage.