

Opportunity Title: Discriminating Polymers Used in Additive Manufacturing Systems with Handheld devices

Opportunity Reference Code: ICPD-2022-05



Organization Office of the Director of National Intelligence (ODNI)

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How to Apply

Create and release your Profile on Zintellect – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at: <https://orise.orau.gov/icpostdoc/index.html>.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/28/2022 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

Polymers used in the formation of a 3D printed component can be well characterized by vibrational spectroscopy in a laboratory setting (e.g., Infrared, Raman) or in real time using a hand held spectrometer that can provide polymer class information for most generic polymer types. However, black-colored polymers do not respond well in handheld instruments due to the carbon black pigmentation causing heavy suppression of the spectral signal. A handheld system that could overcome this obstacle for black polymeric materials is being sought. Further, if this system could also identify UV absorbers in the polymer or more specific polymer types (e.g., distinguishing between additives in acrylonitrile butadiene styrene (ABS) polymers, the utility of this product would be maximized for both construction and comparative analysis purposes.

Example Approaches:

Characterization of the various polymer types using IR and/or Raman spectroscopy would be the basis to further investigate discrimination properties between polymers of the same class. Emphasis should be on characterization of polymer types that are pigmented as "black" where specific colorants (e.g., carbon black) can suppress signal response. This impediment should be able to be mitigated using the sensitivity of benchtop detection systems. Further exploration of other additive properties such as UV absorbers should be investigated and once a validated method for characterization and discrimination is achieved for laboratory work, that method should be transferred to and validated for a handheld instrument to allow for field use.'

Relevance to the Intelligence Community:

This project has relevance for use in the research and development of polymeric objects created for investigative purposes as well as to be able to characterize these polymers in criminal investigations (e.g., using handheld technology to determine what a material is made from quickly and nondestructively, determining what AM objects or starting materials to seize in a search). If this technology can be developed for field use, it can also be used in forensic laboratories as a starting point for further comparative analyses of additively manufactured products in criminal investigations or for intelligence purposes.

Key Words: Additive Manufacturing, Polymers, Chemical Analysis, Vibrational Spectroscopy, Ultra Violet, UV, Acrylonitrile Butadiene Styrene, ABS

Qualifications

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Systems with Handheld devices

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Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
 - **Chemistry and Materials Sciences** (12 )
 - **Communications and Graphics Design** (2 )
 - **Computer, Information, and Data Sciences** (16 )
 - **Earth and Geosciences** (21 )
 - **Engineering** (27 )
 - **Environmental and Marine Sciences** (14 )
 - **Life Health and Medical Sciences** (45 )
 - **Mathematics and Statistics** (10 )
 - **Other Non-Science & Engineering** (2 )
 - **Physics** (16 )
 - **Science & Engineering-related** (1 )
 - **Social and Behavioral Sciences** (27 )