

Opportunity Title: Advancing direct-write printing methods for the fabrication of electronics on complex surfaces

Opportunity Reference Code: IC-18-24

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://orau.org/icpostdoc/>.

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

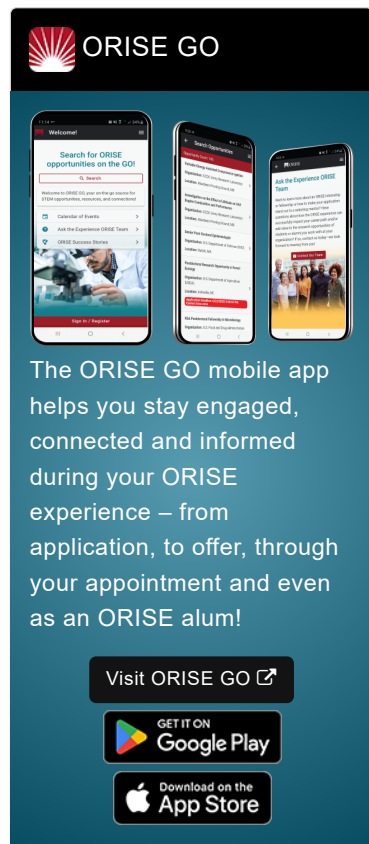
Application Deadline 3/12/2018 11:58:00 PM Eastern Time Zone

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

Aerosol-jet printing methods have been utilized to successfully fabricate multi-layer circuits with the power supply (PS), digital interface (DI) circuit, and electrical ball grid array (BGA) connections for chips. The PS and BGA parts have gone through extensive accelerated life-time testing and have been shown to work on-par with the conventional electronic parts from which they were modeled. In fact, the BGA parts have displayed robust performance and the DI circuit functionality has been demonstrated at GB data rates. However, limitations associated with the fabrication of these circuits are related to lack of determination of long term reliability of low temperature material sets (process ability below 150 °C), fabrication onto flat surfaces, and electronic components that are surface mounted after fabrication of the circuit.

In order to overcome these limitations and advance fabrication capabilities, the following topics require investigation: (1) identify and characterize ink materials that can be processed at temperatures (i.e., below 150 °C) without loss in performance (i.e., better than 6×10^{-8} ?m for conductive materials, good electrical insulation for dielectric inks, dimensional stability for structural inks, and adhesions that survive the 'scotch tape test'); (2) develop printing methods for the fabrication of circuits onto non-flat, 3D printed surfaces; and (3) develop methods for integrating/embedding components into these circuits during fabrication.

Example Approaches:



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Direct-write printing of electronic circuits onto complex surfaces for production level fabrication of 3D printed hybrid electronics will require multiple capability advancements. Proposed approaches could pursue:

- Design capabilities based on additive manufacturing methods that can automatically generate printable toolpaths requiring minimal manual intervention.
- Materials sets formulated for specific functionality, printability and process ability that are compatible with low temperature substrates and components.
- Tool platforms that can accept the specified toolpaths and enable printing of the above materials sets onto 3D surfaces.
- Improved processing/printing capabilities that can combine advancements in order to fabricate the desired electronic circuits.
- Accelerated life-time testing and analysis to verify that the fabricated electronics can function as required in real world settings.

Qualifications 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** ([6](#) 👁)
 - **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** ([5](#) 👁)
 - **Physics** ([16](#) 👁)
 - **Science & Engineering-related** ([1](#) 👁)
 - **Social and Behavioral Sciences** ([28](#) 👁)