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Army Flexible Electronics Sensors: 2D to 3D packaging

S&T Campaign: Materials Research
Electronics

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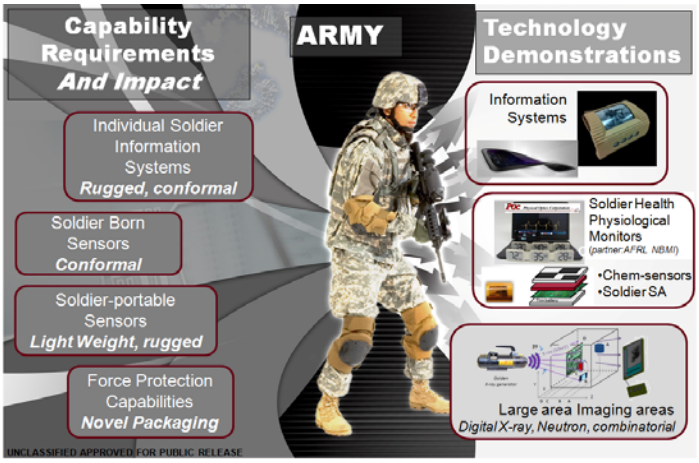
Research Objective

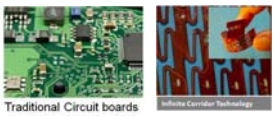
- Develop electronics integrated on textiles and in 3D structures to enable wearable, intelligent garments with integrated distributed sensors, power, data, Identification of Friend or Foe (IFF), or other devices
- Development of electronics on non-traditional substrates will push the boundaries beyond rigid PCB



Challenges

- Integrate Soldier-relevant sensors and control electronics on Soldier-borne platforms
- Electronic interconnects on textiles and in 3D architectures in plastic structures
- Developing sensor platforms in new manufacturing approaches on non-traditional substrates

TODAY's Electronic Packaging...



Traditional Circuit boards

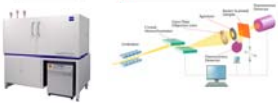
Enabling ***FUTURE*** Soldier Applications

...Developing ***TOMORROW's*** Flexible-Hybrid Electronics: Across DoD Agencies

2-Dimenstional Processing Bond-debond process, printing

3-Dimenstional Processing: nScrypt+photonic sintering

3-Dimenstional x-ray analysis: 3D x-ray CT microscope



Flexible Hybrid Electronics is a growing field of science and manufacturing within the Electronic Manufacturing Service semiconductor segment. Traditional circuit boards are rigid with non-compliant components. PCB's can be formed flexible at the expensive of size. Integration of compliant components on non-traditional substrates enables new Soldier Applications

ARL Facilities and Capabilities Available to Support Collaborative Research

- The Flexible Electronics Team has research facilities to research substrate processing using the Arizona State Univ Flexible Display Center patented bond-debond process. The ARL Facilities have bond and debond at 6" wafer scale.
- ARL facility will include an nScrypt 3D additive tool with integrated chip pick and place capability. The tool will have an integrated Novacentrix photonic sintering
- Organic thermal deposition tool for materials studies integrated with N2 flow-box and encapsulation.
- Complimentary, the facility has a 6"x6" substrate area organic deposition tool.

David Morton: Display technology development since 1987

- PM DARPA HDS and USDC programs
- Current Manages US Army's Flexible Display Center
- 2013 Received the FlexTech Alliance Achievement Award
- 2014 Mantech Achievement Award Nomination
- Founding SID Chair Flexible display sub-committee
- Supporting OSD Flexible Hybrid Electronics IMI Topic development

Eric Forsythe (2001-present) Team Leader Flexible Electronics

- 70 Publications; 1995 citations (H=19); OLED Technology
- PM Flexible Hybrid Electronics Manufacturing Innovation Institute (FHE-MII)
- Deputy PM for FDC an PM for 10 SBIRs
- Former SID Chair SID OLED sub-committee
- Serving as a member of NSET (Nanoscale Science Engineering and Technology): OSTP

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Develop collaborations with flexible electronics industry base to support the development of the technical packaging challenges
- Complimentary materials development for the specialized tools at ARL

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