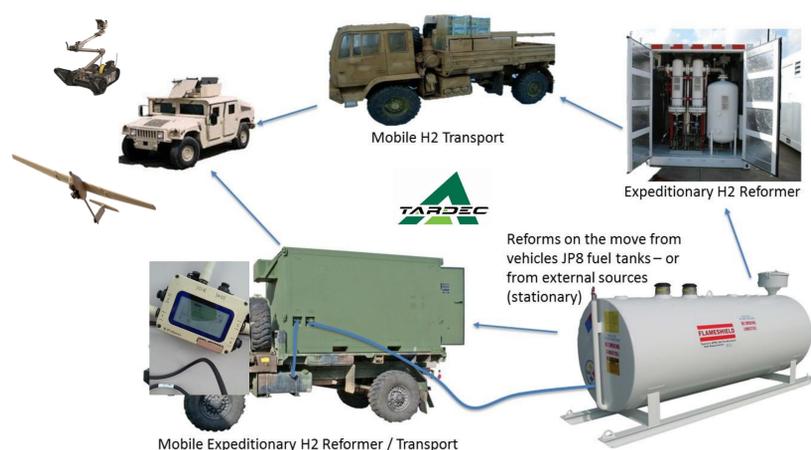


**S&T Campaign: Materials Research**  
*Energy & Power*  
*Power Generation & Energy Harvesting*

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## Research Objective

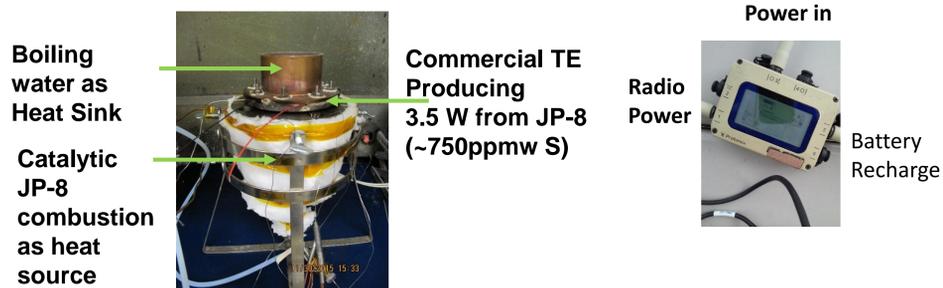
- Develop catalytic materials and reaction technology to enable DoD-wide use of logistics and indigenous fuels in forward operations for Soldier, Squad, Platoon, Company and Platforms
- Improve the endurance and logistics efficiency of military operations currently limited by low energy density battery materials technology.



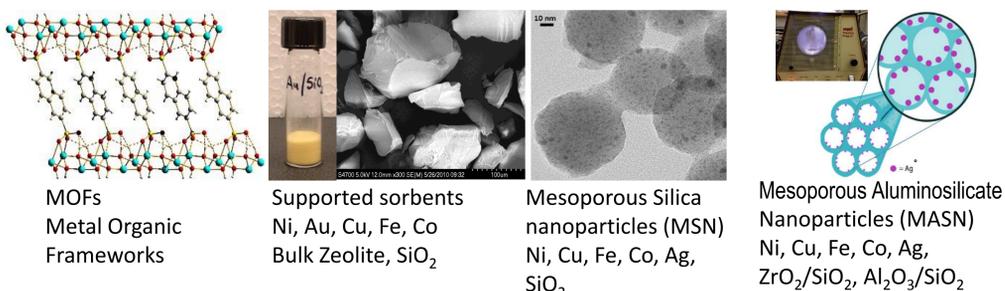
JP-8 Fuel Processing for Fuel Cell Applications

## Challenges

- Presence of organosulfur compounds in logistics jet fuels could poison catalyst materials in fuel cells and other compact power sources.
- Current sulfur remediation process or sub-components too bulky and expensive
- Lack of clean hydrogen sources for fuel cell autonomous platforms



Sulfur Tolerant Combustion Catalyst for Satcom Radio Power and Battery Charge



JP-8 Desulfurization Adsorbent Materials

## ARL Facilities and Capabilities Available to Support Collaborative Research

- Materials characterization with X-ray diffraction, electron microscopy, UV-vis and vibrational spectroscopy, physisorption-chemisorption analyzer, Hg porosimetry
- Jet fuel characterization with GC-MS, sulfur analysis (total sulfur content & Speciation)
- State of the art 15,000 ft<sup>2</sup> clean room used for MEMS fabrication of microstructured palladium membranes for hydrogen purification
- Fuel processing laboratory with 24hr operation capability for long endurance system testing
- LabVIEW controlled catalytic reactors, micro-GC and mass spectrometer, various reaction cells for FTIR spectrometer with in-situ time-resolved capability

Novel, high flux, low cost Pd membrane



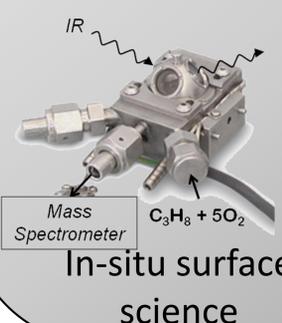
24/7 Fuel Processing Testing



MEMS processing



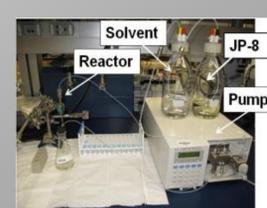
## Catalysis & Reaction Technology at ARL



In-situ surface science



Sulfur analysis



Absorbent screening

## Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Design, modeling, fabrication and systems integration for compact reactors and membrane purifiers
- Computational calculations on desulfurization chemistry and hydrocarbon conversion
- Modeling of surface chemistry on Pd alloy surfaces