NASA SBIR/STTR Technologies

Void Fraction Sensor for Packed-Bed Reactors in Microgravity

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Description and Objectives

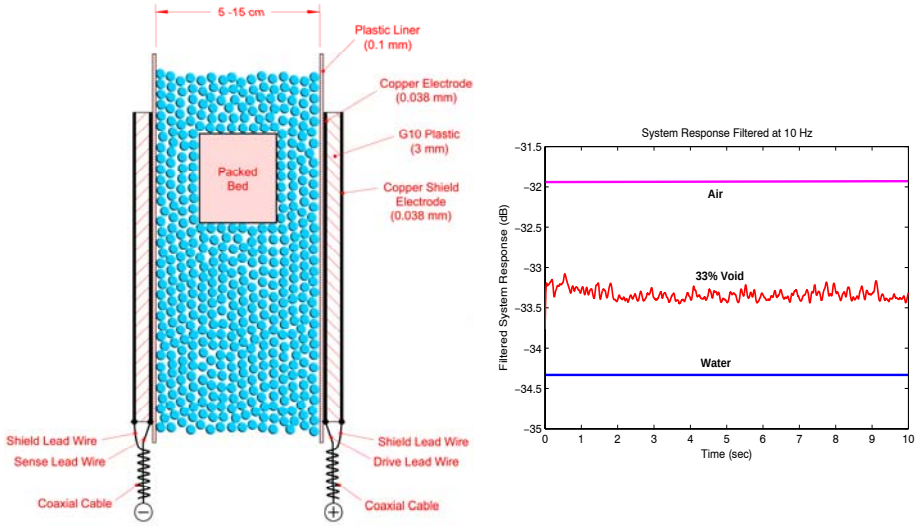
Objective is void fraction instrument for packed-bed reactors:

- Excellent range and sensitivity to void fraction
- Non-intrusive
- Fast response (≥100 Hz) to track pulsed regime
- Space-qualifiable
- Scalable to flight systems (15 cm diameter)
- Leverage previous Creare experience with space-flight-qualified instruments

For development of packed-bed reactors:

- Reactors for long-duration crewed missions to save weight and mass of consumables
- NASA identifies as "severely limiting" technology need
- Design tools needed for low-gravity
- Void fraction measurements needed to develop design tools, or monitor reactor operation

Sensor Configuration and Typical Output



Approach

- Impedance measurement
- High frequency (~4 MHz) electronics for signal-conditioning
- Sensor design for simplified impedance characteristics and minimum parasitic losses
- Comprehensive validation for steady-state and transient two-phase behaviors in packed beds

Subcontractor/Partner

Consultant on packed-beds research:

- Dr. Vemuri Balakotaiah, U. of Houston
- PI for current, related NASA NRA
- Developer of design tools for packed-beds

Potential Commercial Partner:

- Hamilton Sundstrand Space Systems Inc.
- Developer of flight hardware for regenerative life support systems (RLSS)

Schedule and Deliverables

- Instrument prototypes (Month 6)
- Instrument development and calibration (Months 7 through 18)
- Final instrument (Months 19 through 24)

NASA & Commercial Applications

- Current NASA NRA OBPR-01-229 research
- Planned ISS test facilities (TϕFFy)
- Monitoring future RLSS flight hardware
- Cryogenic fluid management
- PEM fuel cell water management

- Monitor gas-oil process reactors for thermal runaway
- Chemical processes
- Biotechnology processes