Particle Heat Transfer Mechanisms

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Kevin Albrecht
kalbrec@sandia.gov
Sandia National Laboratories
34152

FUNDING PROGRAM: **GEN3 CSP SYSTEMS AND LAB SUPPORT**

PROJECT OVERVIEW

- PI: Kevin Albrecht, Sandia National Laboratory
- DOE Funding: $445k (2 years)

SUMMARY STATEMENT

- **Overview:** Solid and gas paths rely on indirect particle heat transfer for power cycle heat addition and moving packed-bed heat exchangers are the baseline design for heat transfer between high pressure gas and particles
- **Problem Statement:** Particle heat transfer in a moving packed-bed is fundamentally limited by packed-bed thermal conductivity and near-wall particle thermal resistance
- **Value Proposition:** Measurement of heat transfer properties at temperature will provide detailed information to be used in heat exchanger design and performance evaluation

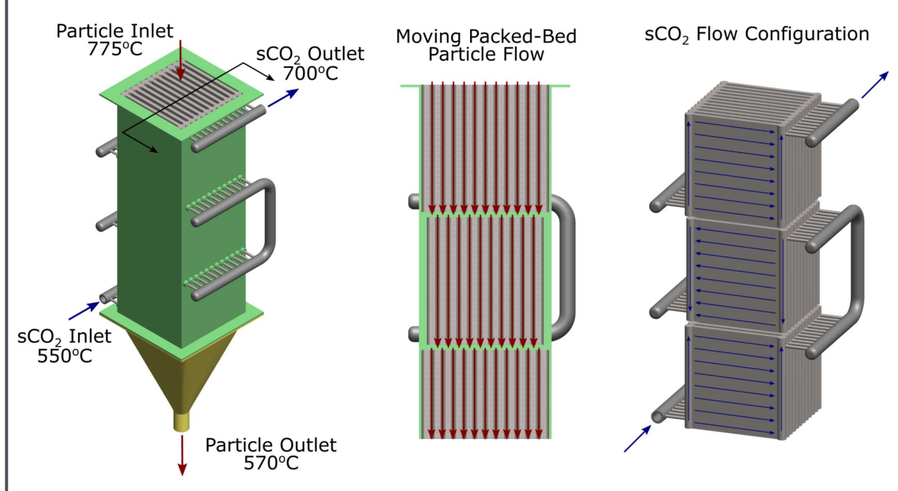
KEY ACTIVITIES

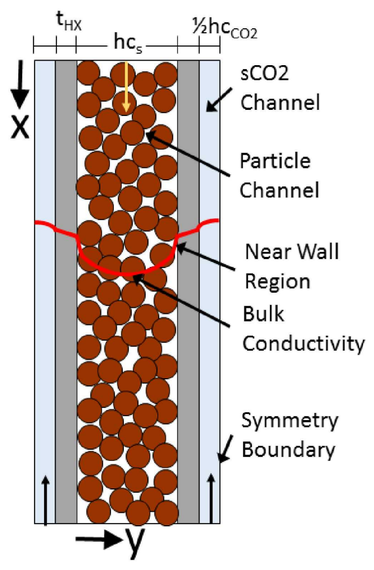
- Develop high-temperature heat transfer experiment capable of separating near-wall and bulk effective heat transfer properties
- Characterize bulk effective thermal conductivity and near-wall particle thermal resistance at CSP operating temperatures
- Support particle selection and heat exchanger design through the measurement and dissemination of particle heat transfer properties

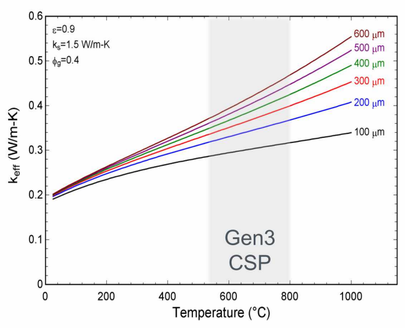
KEY OUTCOMES AND IMPACT

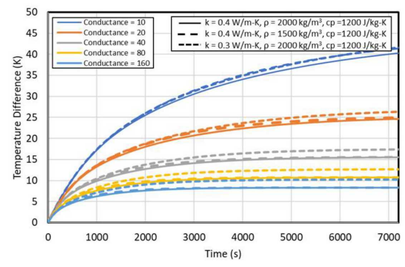
- Phase 1: (9/1/18 – 9/30/19)
  - Particle heat transfer experiment design and construction
  - Characterization and uncertainty quantification of heat transfer measurements
  - Uncertainty propagation into heat exchanger design tools
  - Characterization of as-received particles identified by topic one teams
- Phase 2: (10/1/19 – 9/30/20)
  - Characterization of novel particles and degraded particles
  - Public dissemination of measured properties

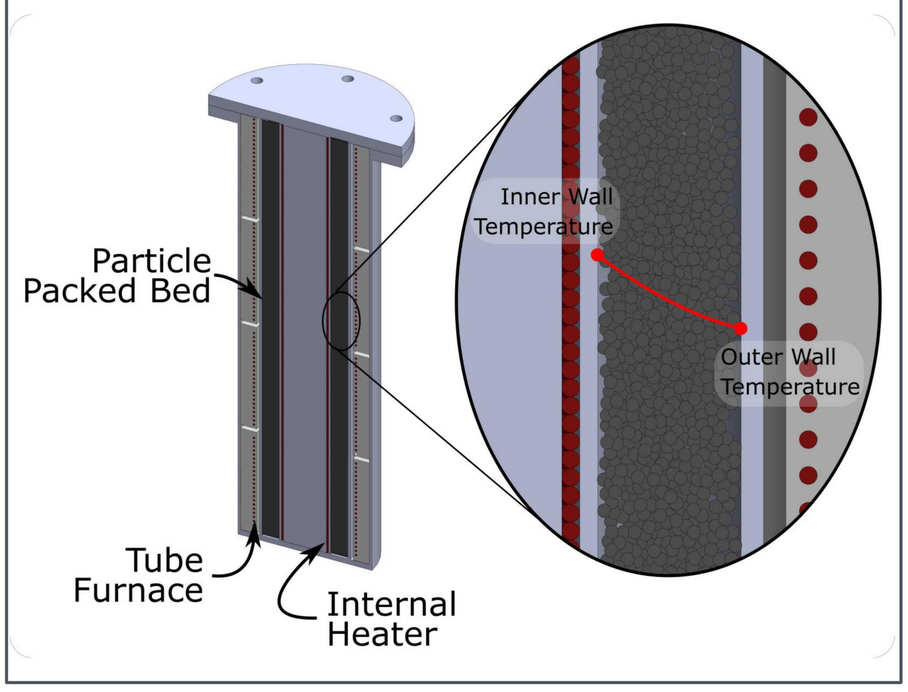
MOVING PACKED-BED HEAT TRANSFER











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