High Temperature SiC Composite Receiver for CSP Operating Above 700 °C, 08995

SiC Composites enable CSP plants to operate at higher temperatures (>700°C) with higher efficiency

1. Impact

High salt exit temperatures (>720°C), increase plant thermal efficiency of >50%, reducing cost.

2. Project Goal

Develop high temperature receiver for CSP plants (2MWth) using SiC fiber composite.

3. Method(s)

- Model material properties, receiver heat transfer, and design to maximize efficiency.
- Evaluate thermal, mechanical, and optical properties.
- Prototype subscale 200 kW receiver.

4. Outcome(s)

- Designed and modeled a conceptual 2MW SiC composite CSP receiver.
- Established polymer infiltration and pyrolysis (PIP) capability. Manufactured SiC composite receiver components.
- Completed 2,500 hours of molten salt corrosion test-No Corrosion.
- Fabrication of 200 kW prototype receiver

5. Conclusion/Risks

- Thermal shock and mechanical impact resistance SiC composite receivers can be produced via PIP with high solar optical absorptance (>0.97) and highly corrosion resistance against chloride salts.
- SiC composites can reduce cost of electricity through increased efficiency at high temperatures.
- Risk: DOE's selection of the solid particle pathway for the Phase 3 Gen3 CSP created new challenges for liquid salt pathway.
- Risk: Demonstrate brazing of assembly

6. Team

Sandia National Laboratories, Albuquerque, NM

NovaTech, Lynchburg, VA

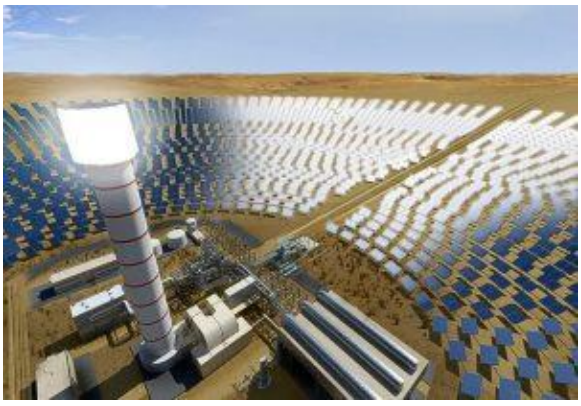
Saint Gobain, Niagara Falls, NY

Starfire Systems, Glenville, NY

University of Wisconsin, Madison, WI

MP Machinery and Testing, State College, PA

Technology Assessment & Transfer, Annapolis, MD



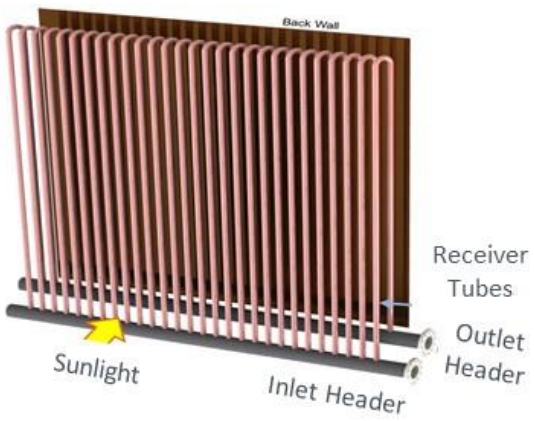


Figure. Silicon carbide fiber composites receiver for high temperature Gen3 CSP plants