A High Flux Microchannel Solar Receiver for Converting Solar Energy into Heat

Tech ID: 33931 / UC Case 2018-031-0

ABSTRACT

Researchers at the University of California, Davis have developed an innovative technology that incorporates advanced microchannel architecture into scalable solar thermal receiver unit cells, enabling highly efficient solar energy conversion.

FULL DESCRIPTION

This technology features a solar thermal receiver with microscale flow passages, designed for highly efficient capture of solar thermal energy. The microchannel solar thermal receiver is scalable and effectively transfers high-intensity solar heat to a working fluid, such as supercritical fluids, molten salts, or molten metals. The working fluid can be heated to temperatures as high as 800°C, enabling its use in various applications, including power generation and process heat decarbonization. This innovative design allows for exceptionally high heat flux capacities and thermal efficiencies, making it a transformative solution for concentrated solar thermal applications.

APPLICATIONS

- Solar thermal power plants and central receiver systems for solar energy.
- Industrial applications requiring high-temperature heat transfer.
- Advanced power cycles, including supercritical Rankine and combined cycle power plants.
- Research and development in high-efficiency solar energy conversion technologies.

FEATURES/BENEFITS

- High heat flux capacities ranging from 100 W/cm2 to 400 W/cm2.
- Thermal efficiencies greater than 90%, with some embodiments exceeding 95%.
- Compatibility with a variety of working fluids including supercritical carbon dioxide, molten salts, and molten metals.
- Advanced materials and fabrication techniques ensure durability under stringent operating conditions.
- Modular design allows for scalable assembly from individual unit cells to large solar receivers.
- Eliminates inefficiencies in current solar thermal receiver technologies.
- Increases the choice of working fluids in solar thermal applications.
- Enables high operating temperatures necessary for advanced power cycles.

PATENT STATUS

Country	Type	Number	Dated	Case

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OTHER INFORMATION

KEYWORDS

solar thermal receivers, supercritical fluids, molten salts, molten metals, thermal efficiency, high heat flux, solar power generation, renewable energy, supercritical carbon dioxide, thermal management

CATEGORIZED AS

- **Energy**
  - Solar
- **Engineering**
  - Engineering
- **Materials & Chemicals**

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- Chemicals
- Composites

RELATED CASES

2018-031-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Predictive Controller that Optimizes Energy and Water Used to Cool Livestock
- High-Efficiency Heat Exchanger Operating at Elevated Temperatures and Pressures
- Microchannel Polymer Heat Exchanger
- Containerized High-Efficiency Cooling and Energy Management System

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