NASA SBIR/STTR Technologies

Advanced Radiative Emitters for Radioisotope Thermophotovoltaic Power Systems

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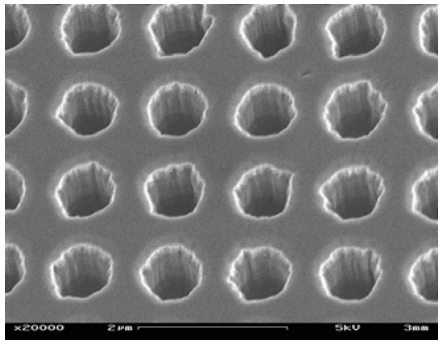
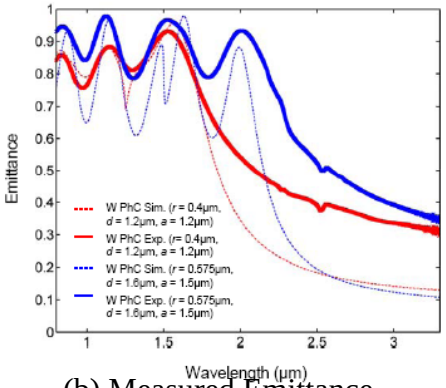
Identification and Significance of Innovation

A key element in Radioisotope Thermophotovoltaic power systems is the radiative emitter that converts GPHS thermal energy to radiative energy that illuminates the PV cell. In this project, Creare and the Massachusetts Institute of Technology (MIT) propose to continue development of an advanced, 2-D, photonic crystal radiative emitter that is optimized for RTPV systems (high spectral emittance below 2 micron, low emittance above that), increasing overall system efficiency.

Expected TRL Range at the end of Contract (1-9): 5



(a) Emitter fabricated in Phase I



(b) Measured Emittance

Technical Objectives and Work Plan

In our 24-month work plan, we plan to demonstrate the following objectives:

- Develop an improved design for the photonic crystal for RTPV applications
  - Improved High Temperature Stability
  - Matched performance to current RTPV operating constraints (Tantalum emitter, 1186K operation)
- Develop and demonstrate techniques for fabricating larger photonic crystals
  - 2.5 cm crystals
  - 10 cm by 10 cm crystals
- Quantify the advantages that the fabricated crystals provide to overall system efficiency

NASA and Non-NASA Applications

NASA Applications:

- TPV-Based Space Power Systems
  - Outer Space
  - Lunar and Mars Explorations

Non-NASA Applications:

- TPV power systems for remote areas
- Small-scale Thermal Batteries
- Replacement for Thermoelectric Systems

Firm Contacts

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