

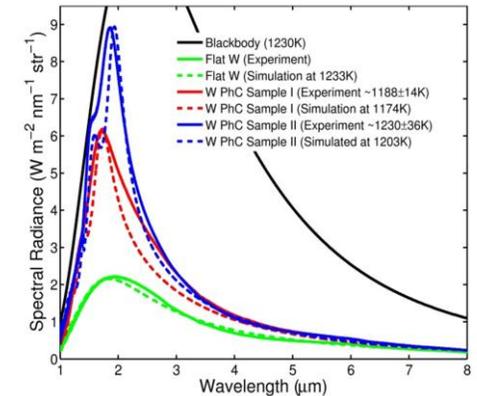
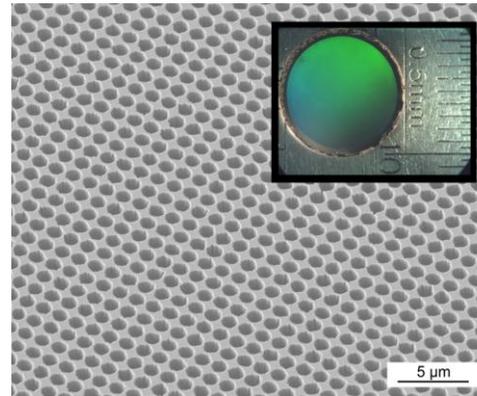
## T3.01-9974 – Advanced Radiative Emitters for Radioisotope Thermophotovoltaic Power Systems

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### Identification and Significance of Innovation

Radioisotope thermophotovoltaic (RTPV) energy converters are a particular type of RPS that directly converts the heat produced by a general purpose heat source (GPHS) to electrical power using a specialized photovoltaic (PV) cell. A key element in an RTPV system is the radiative emitter that converts GPHS thermal energy to radiative energy that illuminates the PV cell. Creare and the MIT have developed and demonstrated an advanced 2-D photonic crystal radiative emitter that provides high emittance in the bandgap of the PV cell with low emittance elsewhere that, when coupled with advanced PV cell filter technology, provides significantly higher system efficiency.



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

### Technical Objectives and Work Plan

The ultimate objective of this effort is to develop and transition a technology that substantially improves the performance of RTPV and TPV systems through the use of improved emitter surfaces. In Phase II, the technical objectives were to set the overall specifications, develop and optimize the photonic crystal fabrication approach for realistic emitter surfaces and materials, evaluate the performance of the fabricated crystals, and demonstrate the technical feasibility of using these photonic crystal surfaces in the actual proposed RTPV system being developed by Creare.

### NASA and Non-NASA Applications

*NASA Applications:* This project's efforts to develop advanced, 2-D photonic emitters extend and complement our ongoing NASA development efforts for higher-performance radioisotope power systems.

*Non-NASA Applications:* In addition to NASA RTPV developments, the Department of Energy and Department of Defense are also developing thermophotovoltaic technology for application to lightweight portable systems and energy recovery systems.

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