

Thermophotovoltaic Generation with Surface Grating Selective Emitters Based on Tungsten Single Crystals

Hiroo Yugami and Hitoshi Sai

Tohoku University

Abstract

Two-dimensional surface-relief gratings with the period of 1.0 - 1.2 μm composed of rectangular microcavities were fabricated on single crystalline W substrates to develop spectrally selective emitters for thermophotovoltaic generation. The emitters displayed strong emission in the near infrared region where narrow-bandgap photovoltaic cells could efficiently convert photons into electricity. The enhancement of thermal emission was attributed to the microcavity effect. Thermophotovoltaic generation tests were carried out with different kinds of emitters. The W gratings showed more than two-time higher generation efficiency as compared with a SiC emitter. The results showed that the microstructured W emitters behave as a good selective emitter which realizes high efficiency and high power density simultaneously.