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Thermal Stability of Nano-Structured Selective Emitters for Thermo Photovoltaic

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Abstract: This study aims to provide the high temperature stability of tungsten selective emitters for thermophotovoltaic (TPV) systems. Photonic crystals have periodic nano-structures that are designed to control the motion of photons at certain wavelengths, giving off light radiation at favorable wavelengths to be absorbed by the adjacent PV cells. However, nano-structures would lose their structural integrity at high temperatures, disrupting the tight tolerances required for the spectral control of the light radiation. We studied four major mechanisms of thermal degradation by which tungsten nano-structures change their geometry when heated over 800oC. Observed degradation modes are recrystallization/grain growth, oxidation, surface diffusion, and evaporation/condensation. Identification of degradation modes and the thorough understandings of each degradation phenomenon is performed experimentally and analytically.

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