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发光学应用及交叉前沿

表面微结构辐射器几何结构对发射性能的影响

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摘要： 放射性同位素热光伏系统(RTPV)中表面微结构辐射器几何尺寸是决定其发射性能和系统效率的关键因素之一。本文通过对单个钨微腔宽度、高度以及壁厚对辐射器发射性能影响的探讨,初步得出了其红外辐射出射特点的产生原因,并利用时域有限差分算法(FDTD)对不同几何尺寸微腔的发射性能进行了对比。最后结合GaSb量子效率曲线,发现当微腔高度、宽度与壁厚分别为0.8,1.8,0.1 μm时,其发射性能与GaSb匹配程度较好。

关键词： 辐射器 几何尺寸 微腔 发射性能

Influence of Physical Dimension of The Mircostructural Surface Emitters on Emission Performance

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Abstract: The physical dimension of mircostructural surface emitters is one of the key factors which determines the emission performance and system efficiency in radioisotope thermophotovoltaic (RTPV) systems. This paper preliminarily concluded the reasons for the emitters' characteristics of infrared radiation through the exploration of the effects that the width, height and walls' thickness of a single tungsten mircocavity played on the radiator's emission performance. Then the finite-different-time-domain (FDTD) method was utilized to compare the emission performance of microcavities with different sizes. It is found that the emission performance matches well in the GaSb case taking into account of the efficiency curve of GaSb which the width, height and walls' thickness of a single mircocavity are set as 0.8, 1.8, 0.1 μm, respectively.

Keywords: emitter physical dimension mircocavity emission performance

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