THE DEVELOPMENT OF TUBULAR PLATINUM-EMITTER REACTOR FOR A SMALL-SCALE THERMOPHOTOVOLTAIC POWER SYSTEM

This paper centers on the development of a micro-scale combustion-driven thermophotovoltaic (TPV) power generation system. The Micro-TPV system is a direct energy conversion device. It does not have any moving parts, and it converts the thermal power to electrical power directly. In this thesis, the first task is to design a combustor as an emitter for TPV power system. The characteristics of the combustor is to use catalyst tube with specific configuration and fuel/air mixture deployments to overcome the shortcomings of combustion instability and radical termination in a small-scale confined channel. Backward-facing step and percolated platinum tube are employed in a small-scale combustor to enhance flame stabilization and extend stable flammability. The stable operating range of the proposed tubular combustor is verified. The quartz tube is used as an analogous emitter due to its easy-manufacture. The GaSb PV cell is engaged in the TPV system due to its inherently low band gap of PV cells responding up to 1.8 μm. The integration sphere is performed to measure the radiant emissions of the proposed reactor. Eventually, assembling the TPV reactor with PV cell arrays is demonstrated and the corresponding overall efficiency is determined.