World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:10, No:01, 2016

Energy Dynamics of Solar Thermionic Power Conversion with Emitter of Graphene

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Abstract : Graphene can stand very high temperature up to 4500 K in vacuum and has potential for application in thermionic energy converter. In this paper, we discuss the application of energy dynamics principles and the modified Richardson-Dushman Equation, to estimate the efficiency of solar power conversion to electrical power by a solar thermionic energy converter (STEC) containing emitter made of graphene. We present detailed simulation of power output for different solar insolation, diameter of parabolic concentrator, area of the graphene emitter (same as that of the collector), temperature of the collector, physical dimensions of the emitter-collector etc. After discussing possible methods of reduction or elimination of space charge problem using magnetic field and gate, we finally discuss relative advantages of using emitters made of graphene, carbon nanotube and metals respectively in a STEC.

Keywords : graphene, high temperature, modified Richardson-Dushman equation, solar thermionic energy converter
Conference Title : ICMNSS 2016 : International Conference on MEMS, Nano and Smart Systems
Conference Location : San Diego, United States
Conference Dates : January 21-22, 2016