Absorbing Layer Design for Infrared Detectors by Topology Optimization

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Infrared (IR) detectors are widely used in variety of fields such as night vision devices. It is well known that the overall performance of IR detectors is significantly related to the absorbing efficiency of the IR detector. However, researches concerning detailed design of the absorbing layer on IR detectors have not been fully developed. Therefore, this study aims to enhance the performance of IR detectors through the structural modification of absorbing layer design using the topology optimization scheme. The optimization method is applied to electromagnetic wave propagation problems based on the time dependent finite element analysis. The main objective of the structural modification is to increase the transmittance of the 1064nm incident wave passing through the absorbing layer. The design objective function is set to maximize the Poynting vector in the prescribed specific measuring domain. To confirm the optimally designed structure, the prototype of the absorbing layer has been fabricated and its experimental verification is followed.

Keywords: Near-Infrared Detector, Absorbing Layer, Topology Optimization, Time Dependent Finite Element Analysis

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