

Heating Of Thermoelectric Bi-Sb Thin Film Due To THz Irradiation Absorption

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Abstract

We present the model of THz sensor based on thermoelectric Bi-Sb thin films. The model is based on an electromagnetic heating interface and combines radiofrequency and heat transfer modules. The studied frequency was 0.14 THz, irradiation power 30 mW. Films had a thickness of 150 nm and were located on the dielectric substrate (mica, 40 micrometres thickness). The absorption of THz irradiation in thin films was described in terms of transition boundary condition (dielectric loss model). Heat transfer in thin films was described through the thin layer option (thermally thin approximation). The real and imaginary relative permittivity and electrical conductivity were measured in a THz frequency range and then used in the electric displacement field model.

The calculations showed the temperature gradient up to 0.7 K/cm (fig.1). Temperature field formed due to the THz irradiation absorption is presented in fig.2.

Figures used in the abstract

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Figure 1 : Temperature gradient magnitude in the film

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Figure 2 : Temperature field in the film