S. FRIDJINE and M. AMLOUK

https://doi.org/10.1142/S0217984909020321 | **Cited by:** 72 **(Source: Crossref)**

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Abstract

In this study, we define a synthetic parameter: optothermal expansivity as a quantitative guide to evaluating and optimizing both the thermal and the optical performance of PV–T functional materials. The definition of this parameter, ψ_{AB} (Amlouk–Boubaker parameter), takes into account the thermal diffusivity and the optical effective absorptivity of the material. The values of this parameter, which seems to be a characteristic one, correspond to the total volume that contains a fixed amount of heat per unit time ($m^3\ s^{-1}$) and can be considered as a 3D velocity of the transmitted heat inside the material.

As the PV–T combined devices need to have simultaneous optical and thermal efficiency, we try to investigate some recently proposed materials (β-SnS_2, In_2S_3, $ZnS_{1-x}Se_x|_{0 \le x<0.5}$ and Zn-doped thioindate compounds) using the newly established ψ_{AB}/E_g abacus.

Keywords: Solar spectrum ▪ In_2S_3 ▪ $ZnIn_2S_4$ ▪ optothermal expansivity ▪ effective absorbance ▪ thermal diffusivity

PACS: 61.82.Fk, 66.30.Xj, 66.70.Df, 78.20.Ci, 78.66.Li, 79.60.Dp, 84.60.Jt, 91.60.Ki

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