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< Previous

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

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