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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 ($\text{m}^3 \text{s}^{-1}$) 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 ($\beta\text{-SnS}_2$, In_2S_3 , $\text{ZnS}_{1-x}\text{Se}_x|_{0 \leq x < 0.5}$ 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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