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# Nonlinear Absorption in Perovskite Materials

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Optical absorption is of paramount importance for any material that is used in photovoltaic, lasing, light emitting diodes, etc., applications. Perovskite materials have several potential nonlinear optical applications. A thorough understanding of two-photon absorption (TPA) in perovskite semiconductors is required for nonlinear optical applications [1-4]. We have derived a TPA coefficient K2 for perovskite semiconductors using second-order perturbation theory and within the parabolic-band approximation, including excitonic effects. The derived K2 has Egˆ3/2 dependence and shows that perovskite semiconductors exhibit allowed-forbidden two-photon transitions. We have found that in perovskite materials, the increasing bandgap with temperature contributes to an increase in K2 from 290 K to 50 K [5], which is contrary to the TPA coefficient behaviour in most tetrahedral semiconductors. There is a satisfactory agreement between the theoretical and the experimental TPA coefficients at 290 K and 50 K. Our study highlights the importance of including excitonic and relativistic effects when considering TPA spectra in perovskite semiconductors.

## Field of Condensed Matter

Energy and Functional Materials

**Author:** Dr OMPONG, David

**Co-authors:** Dr SETSOAFIA, Daniel Dodzi Yao (Charles Darwin University); Mr OFOSU, Emmanuel; Dr MEHDIZADEH- RAD, Hooman (Charles Darwin University); Prof. SINGH, Jai (Charles Darwin University); SREEDHAR RAM, Kiran (Charles Darwin University); Dr DONKOR, Michael Edem

**Presenter:** Dr OMPONG, David

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