

An Improved Model to Predict the Temperature Dependence of Refractive Index of InP-based Compounds

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Abstract

Temperature variation affects the refractive index of the material constitute an integrated optical loss which in turn, impacts the optical properties of the photonic device. After extensive literature survey, it is found that there is no accurate physical model available to calculate the variation of refractive index due to the change in temperature for InP/InGaAsP material except Weber's model, which is an extension of **Adachi's Model**. In this paper, it is demonstrated that the available models are not in good agreement with experimental data available in literature. Furthermore, an extension of modified single oscillator model is proposed which can be used to calculate the thermo-optic coefficient of InP/InGaAsP material.

Keywords

Thermo-optic coefficient Weber model Modified single oscillator model Refractive index Optical waveguides

References

1. Fiedler, F., & Schlachetzki, A. (1987). Optical parameters of InP-based waveguides. *Solid-State Electronics*, 30(1), 73–83.
[CrossRef](https://doi.org/10.1016/0038-1101(87)90032-3) (https://doi.org/10.1016/0038-1101(87)90032-3)
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Optical%20parameters%20of%20InP-based%20waveguides&author=F.%20Fiedler&author=A.%20Schlachetzki&journal=Solid-State%20Electronics&volume=30&issue=1&pages=73-83&publication_year=1987) (http://scholar.google.com/scholar_lookup?title=Optical%20parameters%20of%20InP-based%20waveguides&author=F.%20Fiedler&author=A.%20Schlachetzki&journal=Solid-State%20Electronics&volume=30&issue=1&pages=73-83&publication_year=1987)
2. Smit, M., Leijtsens, X., Ambrosius, H., Bente, E., Van der Tol, J., Smalbrugge, B., et al. (2014). An introduction to InP-based generic integration technology. *Semiconductor Science and Technology*, 29(8), 083001.
[CrossRef](https://doi.org/10.1088/0268-1242/29/8/083001) (https://doi.org/10.1088/0268-1242/29/8/083001)