Ultrafast Terahertz Photoconductivity and Phonon Dynamics in PbTe:CaF_2 Thin Films

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In this work, we investigate the effect of CaF_2 doping on both the magnitude and ultrafast dynamics of photoconductivity in PbTe thin films using terahertz (THz) spectroscopy. THz time-domain spectroscopy (THz-TDS) and optical pump–THz probe (OPTP) techniques were employed to probe charge and lattice dynamics as a function of doping concentration and temperature. THz-TDS measurements provided insight into the complex dielectric constant spectral behavior in the terahertz region, evidencing a low-energy phonon response [1]. Meanwhile, OPTP spectroscopy resolved ultrafast carrier relaxation and phonon interactions, revealing significant modifications in carrier lifetime, mobility, and recombination dynamics induced by CaF_2 incorporation. These results shed light on the interplay between charge and lattice dynamics in this system, offering new perspectives for tailoring PbTe-based materials for advanced optoelectronic applications [2].

REFERENCES

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ACKNOWLEDGEMENTS

This work has been supported by FAPESP grants #2022/03035−9 and #2024/07460-1.