

Peer Review

Review of: "Terahertz-Induced Second-Harmonic Generation in Quantum Paraelectrics: Hot-Phonon Effect"

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In this manuscript, the authors showed an analysis of experimental results on the terahertz-induced time-resolved SHG response in the paraelectric material KTaO_3 , using numerical simulations based on a dynamic model, and concluded that the long-lived non-oscillating component observed in recent terahertz pump-SHG probe experiments under ultrafast excitation is a result of the induced nonequilibrium hot phonon effect. Their findings challenge the conventional concept of transient ferroelectric order induced by THz pulses. I consider that their model and experiments are reasonable and reliable, and the experimental results show good agreement with the theoretical predictions. Overall, I believe this paper has potential for publication.

However, the authors' analysis suggests that the observed response "can be also explained by the contribution of the nonequilibrium hot phonon effect," rather than definitively concluding that this is the sole mechanism. I would like the authors to clarify whether the observed results alone are not conclusive for one of the two interpretations, or whether they provide support from other experiments. I recognize that their proposed mechanism is analogous to four-wave mixing. Could the authors evaluate this possibility, for instance, by using crossed polarization between the terahertz and optical pulses?

Additionally, the authors should comment on the sample thickness and show that the contribution of phase-mismatching is negligible.

Declarations

Potential competing interests: No potential competing interests to declare.