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Pulse-duration dependent structural change mechanism in $Ge_2Sb_2Te_5$ DONG HAK KIM, DAEYOUNG LIM, Kyung Hee University — The mechanism of ultrafast structural change in $Ge_2Sb_2Te_5$ (GST) induced by optical excitation was studied by using pump-probe coherent optical phonon (COP) spectroscopy. The structural change mechanism showed strong dependency on the duration of the pump pulse. While the frequency of displacively generated A_1 COP was observed to red-shift (by more than $\sim 5\%$) in the 2-3 ps time-scale for a long pulse excitation ($\sim$100fs), it was instantaneous in the case of short pulse excitation. Furthermore, the shifted COP frequency in the intermediate, transient state was almost independent of the pulse duration or the fluence of the optical pump, which, along with the pulse duration dependency, cannot be explained by photoexcited high-density carriers or thermal effect. The strong dependency of the observed time-scale on the pulse duration and the fluence-independent COP frequency in the transient state indicate that coherent atomic motion due to ultrafast COP generation plays a dominant role in the transition to intermediate, transient state.

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