

Temporal optical response of GeSbTe/GeCuTe double-layered film and its application to pulse-delay discriminator

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ABSTRACT

Chalcogenide phase change materials (PCMs) exhibit a high contrast in the optical constants between the crystalline and amorphous phases. In most of the PCMs, the absorption coefficient of crystalline phase is larger than that of amorphous phase and the transmission increases when it is amorphized. To the contrary, some PCMs like GeCuTe (GCT) show opposite behavior in absorption upon phase change. It is expected that, similar to GeSbTe (GST), principal structural change in amorphization of GCT completes in subpico- to pico-second time scale triggered by a high density electron excitation. A combination of the ultrafast amorphization and the distinct difference in absorption change between GST and GCT will provide a new functionality. In this study, we discuss the possibility to discriminate the relative delay in pulse arrival times in subpico-second time resolution by utilizing a GST/GCT multi-layered thin film. This can be applied to a pulse skew measurement in parallel optical transmission systems.

Key words: GeCuTe, ultrafast amorphization, femtosecond pulse, hetero-multilayered thin film