

L1 PHASE TRANSFORMATIONS TRIGGERED BY ULTRASHORT LASER
PULSES AND THEIR APPLICATION TO OPTICAL STORAGE

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It is well known that laser pulses can easily induce phase transformations, the solid-liquid one being the most studied one because of its relevance to produce surface layers with improved physical properties. Laser induced amorphous-to-crystalline phase transformations are also of much interest since they are currently used in optical CD-ROM and DVD disks to storage information. When this transformation can be reversed, the disk becomes erasable and current research trends focus on both improving the storage capacity and the transfer rates.

The properties of the material upon laser irradiation depend very much on the laser irradiation conditions, particularly on the pulse duration, and the thermal properties of the processed and unprocessed materials since all of them regulate the cooling rate. Extremely high cooling rates and undercoolings can be achieved that facilitates the production of metastable phases or non-conventional processes. This lecture will review the main parameters controlling such cooling process in thin Ge films and will show the special features of the transformation mechanism when shortening the pulse duration from a few ns to a few ps. These ideas will be then extended to the GeSb system to show that reversible fast amorphous – to –crystalline phase changes triggered by 30 ps are feasible, the transformation being completed in 450 ps. The special features that arise when irradiating with fs laser pulses will be discussed in terms of the transient formation of a non thermal phase in the 250 fs time scale.