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**Critical parameters influencing the material distribution produced by
pulsed laser deposition**

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Pulsed laser deposition (PLD) is a suitable method for the synthesis of good quality complex materials in thin film configuration. Nevertheless the difficulties inherent to the deposition of large areas with a homogeneous thickness profile has hindered some of its potential applications. Related to this problem is the influence of the experimental deposition conditions in the actual thickness profile of the deposit. There are a number of reports in which this subject has been studied but some aspects remain still open. In this work we aim to study the influence of the laser beam energy distribution and energy density, and the gas pressure during deposition on the film thickness distribution.

Laser ablation has been carried out using two different excimer lasers, both at 193 nm with nominally gaussian/top-hat (short/long axis) spatial energy beam distributions. For both lasers the real beam profile is a more or less bimodal distribution along the long axis. This distribution was modified in purpose in order to determine its influence on the deposit distribution. Lenses of different focal length were used, and the lens-target distance was varied, thus changing the energy density and the spot size on the target. Different single element targets (Cu, Ge, Bi) have been chosen in order to have materials with quite different ablation thresholds. The films were deposited on glass substrates held at room temperature. The spatial distribution of the deposited material has been analyzed by means of optical microdensitometry, since the measured optical density is, to a good approximation, proportional to the film thickness for absorbing films. The results show that the distribution of the material deposited on the substrate is strongly influenced by all these parameters. In vacuum and at energy densities well above the ablation threshold a clear asymmetric distribution is measured. The typical symmetric distribution appears only when either a relatively low fluence (close to the ablation threshold) is used, a post-focal position is chosen, or a moderate gas pressure is introduced in the chamber during deposition. The optimum conditions for growth using non-ideal laser beam profiles are discussed.

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