

3618-45

Pulsed Laser Deposition of Nanocomposite Thin Films for Photonic Applications

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Nanocomposite thin films formed by metal or semiconductor nanocrystals (NCs) embedded in a host exhibit interesting properties related to the small size of the NC's (typically around 10 nm or below). From the optical point of view, the new excitement and interest in these NC-materials come mainly from their non-linear optical properties which make them potential candidates for all-optical switching devices and the challenge is to produce a suitable material.

Pulsed laser deposition (PLD) is a recently developed technique which has been shown to be excellent to produce complex oxide thin films such as those required to host the NCs. This presentation will show that the nanocomposite material produced by PLD can have superior structural and non-linear optical properties than those obtained by other techniques. The results will be illustrated in systems formed by metallic NCs (Bi, Fe, Cu) embedded in an Al_2O_3 films will be discussed as a function of the NC size and it will be shown that third order optical susceptibility values as high as 10^{-7} esu can be easily achieved.