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Band gap energy and refractive index dependence of femtosecond laser induced damage threshold in dielectric thin films

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ABSTRACT

A novel, compact model for the calculation of ultra-fast laser induced damage threshold in terms of the thin film refractive index and band gap energy is achieved in the present research. Multi photon absorption mechanism is assumed to provide main contribution to the femtosecond damage behavior of dielectric thin films. Single active electron approximation is carried on through the Volkov wave function and evolution operator consideration. The results of the present study are in good accordance with the experimental data and demonstrate higher accuracy than other models. Ultra-fast laser induced damage behavior of some mixtures which, cannot be interpreted by existing models can be understood by the present approach. Pulse duration dependence of the present model is also investigated and confirmed by the experimental reports. Violating conditions of the present model are also addressed.

Key Words: Femtosecond, Laser Induced Damage, Thin Film, Single Active Electron Approximation, Refractive Index, Band Gap.

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