# A Study on the Characteristics of Se/ZnS Thin Film Light Amplifiers

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## Abstract

*Using Se as a photoconductive element and ZnS as a luminescent element, a Se/ZnS thin film device for light amplifier applications was fabricated and its characteristics were investigated. At various conditions of substrate temperatures, heat treatment times, and heat treatment temperatures, Se thin films and ZnS thin films were separately deposited by an EBE(Electron Beam Evaporation) method of an high accuracy in deposition rates and the optimum fabrication conditions for the Se thin film and the ZnS thin film with a hexagonal structure were obtained. The Se/ZnS thin film light amplifier was fabricated by evaporating the ZnS thin film on an ITO(Indium Tin Oxide) glass and the Se thin film on the ZnS thin film in sequence.*

**The results of the characteristics investigation are summarized as follows:**

(1) When the frequency of an excitation voltage was increased, both the brightness response and the brightness saturation of the Se/ZnS thin film light amplifier began to start at a higher light input.

(2) The gain of the Se/ZnS thin film light amplifier was dependent upon the amplitude and the frequency of the excitation voltage as well as an external light input.

(3) When the Se/ZnS thin film light amplifier was excited by a direct current of a constant voltage, the frequency of the output brightness was equal to the frequency of the input light applied. When the light amplifier was excited by a sinusoidal voltage of 60 Hz, the frequency of the output brightness was 120 Hz.

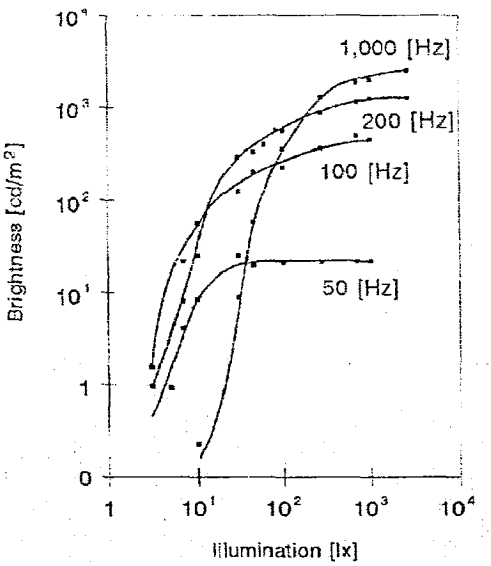


Fig.1. Brigtness of Se/ZnS Light Amplifier at various Frequency.

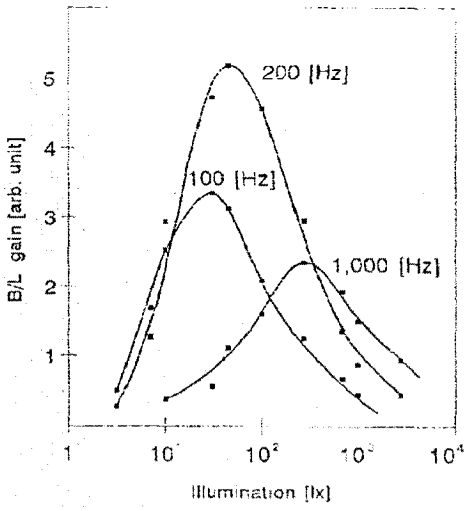


Fig.2. B/L gain of Se/ZnS light Amplifier at various Frequency.

(4) The lattice mismatch of the Se/ZnS thin film light amplifier at an optimized fabrication condition was 3.2 %.

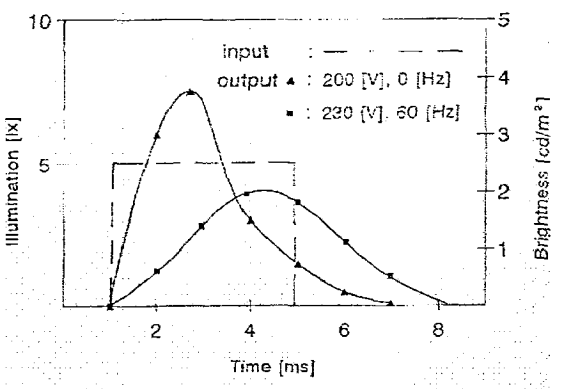


Fig.3. Time Response of Se/ZnS light Amplifier at low Frequency. (50[Hz]< f < 200[Hz])

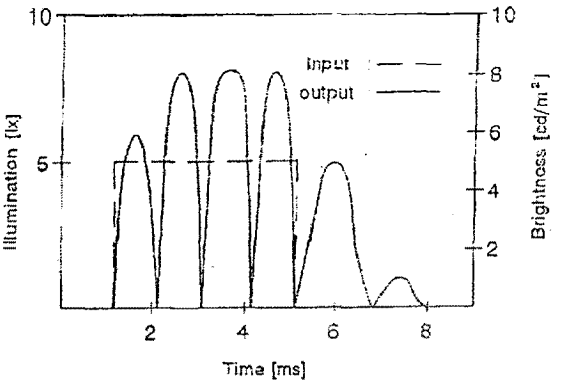


Fig.4. Time Response of Se/ZnS light Amplifier at high Frequency. (f> 500[Hz])

From these results, it is believed that the Se/ZnS thin film light amplifier would become one of the strong candidates for such applications as the optoelectronic systems and the logic circuits of optoelectronic gates for opto-information communica- tions and processing. In the near future, the application and the contribution to the research for the image transmission and the optocomputer realization are also expected.