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Abstract (via Prec.)

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**Luminiscence measurements and properties of Ti:sapphire layers created by PLD**

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The development of miniature, compact and efficient lasers compatible with fiber and integrated optics are of great interest from scientific and technological point of view. Planar waveguide lasers are of interest in the last several years. In this work we describe the properties of Ti:saphire films created on sapphire and quartz substrates by method of pulsed laser deposition (PLD).

The thin films of Ti:sapphire were created by KrF laser ablation on (0001) and ($1\bar{1}02$) sapphire substrates from crystalline Ti:sapphire target (0.1 wt %) . Laser energy density was 3 Jcm-2 and repetition rate 25 Hz. Substrates were heated in the range Ts of 1000°C - 1300°C. Target-substrate distance was 4 cm; films were created in vacuum $10^{-4}$ mbar. Film thickness was 6 μm.

Films luminiscence was studied on monochromator at room temperature in the range 600- 900 nm with step 1 nm. The excitation was performed with $Ar^-$ laser at 488 nm with output energy 100 mW. The luminiscence peaks from films created on (0001) sapphire was always higher than that on ($1\bar{1}02$) sapphire. The highest peak was reached for Ts round 1100 °C. With increasing Ts the height of luminiscence peaks is decreasing - see Fig.1. The concentration of $Ti_2O_3$ in the films was 0.06-0.07 wt%. It is smaller than that of target material. Fluorescence lifetime of layers was measured at 480 nm wavelength using photoncounting method. The lifetime of films on (0001) sapphire was 2.6 - 2.8 μm. It is smaller that the lifetime of target material (3.6 μs). The lower value of lifetime can be influenced by some defect centers in the deposited layers. Index of refraction n of layers and substrates were measured with spectroscopic ellipsometry. It was found that n of deposited Ti:sapphire layers is a little higher that of substrates (example- see Fig.2.). Nevertheless the waveguiding effect in Ti:sapphire layers created on sapphire substrates was not observed. Higher difference between

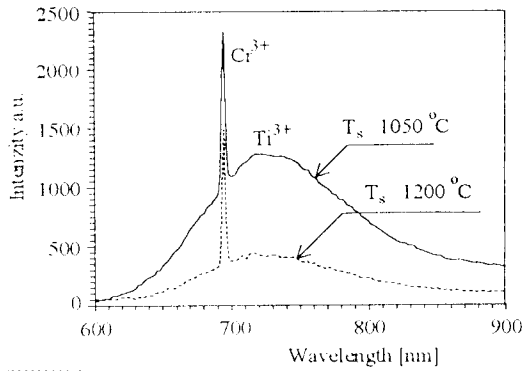


*Fig1. Luminiscence spectra of Ti:sapphire films prepared on sapphire (0001) vs Ts. Excitation with $Ar^+$ laser,488 nm, 100 mW. Also Cr was presented in substrates*

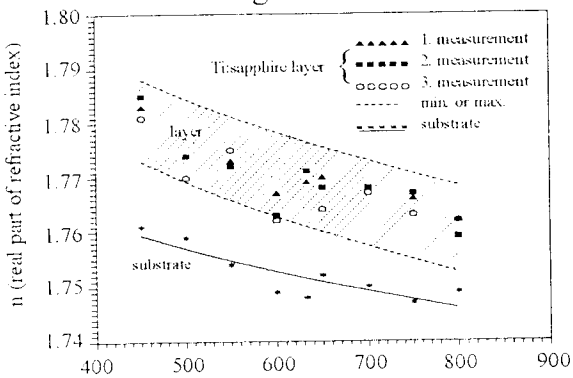


*Fig. 2. Refractive index as a function of wavelength for Ti:sapphire layer prepared on (1102) substrrate and substrate (measured*

index of refraction of layer and substrate (or thicker film) is needed. It was confirmed when we have created Ti:sapphire layer (from 0.49wt% target) on (001) quartz substate. In that case (for layer thickness of 250 nm) one waveguiding mode were observed.