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Pulsed laser deposition of thin films from the ablation of $BaTiS_3$ perovskites at different fluences

Thin films were deposited from the ablation in vacuum of a bulk $BaTiS_3$ perovskite target with a Nd:YAG laser emitting at 1064 nm with 10 Hz repetition rate and 6 ns pulse duration. The output energy per pulse of the laser is 750 mJ. However, for the present experiments, the energy was attenuated by the use of a polarizing beam attenuator in order to change the energy density (fluence) incident on the target.
Thin films were deposited on glass substrates at 4 different fluences: 15.2, 8.1, 4.1 and 2.7 J/cm^2. The laser produced plasmas were diagnosed by means the of time of flight curves obtained from planar Langmuir probe measurements in order to estimate the ion mean kinetic energy and density. It was found that ion density remained constant for increasing fluence. The mean kinetic ion energy was calculated considering both Ba and Ti positive ions and it was found that the energy increases with fluence.
The obtained films were structurally characterized by XRD where an amorphous structure was revealed regardless the fluence. Optical characterization was carried out by means of UV-Vis spectroscopy. The films showed transmittance values in the range of 60-80 % for 600-1100 nm without a clear dependence on fluence, however, the estimated band gap from Tauc plots, shows a trend to increase with increasing fluence, having values between 2.76-2.98 eV. Finally, the chemical composition and oxidation states were studied by means of XPS.

Keywords

Perovskite, PLD, plasma diagnosis, Langmuir probe, Thin films

Reference

No reference

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Author approval

I confirm

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