Fabrication of PZT films for use in voltage-driven magneto-optic spatial light modulators

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A spatial light modulator (SLM) is real-time programmable device capable of modifying amplitude, phase and polarization of optical wave front by electrical control signal. So far, various types of reusable SLMs with two-dimensional pixel arrays have been intensively developed. A magneto-optic spatial light modulator (MOSLM) has the advantages of high switching speed, robustness, nonvolatility and radioactive resistance. However, because the conventional MOSLM is driven by a large current, large power consumption is required. To overcome the disadvantage, we develope a MOSLM with a PZT film which is driven by electric field and external magnetic field.

In our PZT-driven MOSLM, a driving current was less than 1/10 time as compared with that of the conventional MOSLM [1], however, a magneto-optic Bi:YIG layer was damaged by high temperature process for crystallization of the PZT film. Therefore, an aerosol deposition method (ADM), which produces a film by using accelerated material particles with impact energy [2], was used to fabricate the PZT film on the Bi:YIG layer. Moreover, in order to give effective stress by the PZT film to the Bi:YIG layer, we simulated the structure of the PZT-driven MOSLM by using the finite element method. In addition, we fabricated the PZT-driven MOSLM on flat-surface Bi:YIG film by a site-selected epitaxial method. The selected pixels of the MOSLM were successfully switched.

References

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