Integrated magneto-optic light switch arrays by using bismuth substituted iron-garnet

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The magneto-optic spatial light modulators (MOSLMs) have the advantages of high switching speed, robustness, nonvolatility, and radioactive resistance. We demonstrated a magneto-optic spatial light modulator with one-step pattern formation of bismuth-substituted iron-garnet films by liquid phase epitaxy (LPE). The one-step pixel growth by LPE is based on the combination of a single-crystal epitaxial film growth (pixel area) and a impeded film growth (pixel gap area) on a substrate whose surface has been locally damaged and milled by ion bombardment before film deposition. The interface between pixel (single-crystal expitaxial area) and pixel gap (perturbed epitaxial area) guides magnetic walls just like a groove. The MOSLM with one-step pixel formation had the layer structure of substrate (SGGG) / bismuth-substituted iron-garnet layer with one-step pixel growth / reflective Al layer / insulator layer / bottom conductor line / insulator layer / top conductor line. The one-step grown pixels were 16 μm×16 μm with pixel gap of 2 μm. The total number of pixels was 16×16=256. The fabricated prototype MOSLM is switched by applying driving currents of 40 mA for the bottom conductor line and 80 mA for the top conductor line under external bias field of 20 Oe, which is over 2 times smaller than that of the conventional MOSLM. These results strongly suggest that the novel MOSLM can provide higher resolution, simpler fabrication process, more compact systems and lower driving current.

References

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