Fabrication of MEMS-integrated photonic crystal waveguide and demonstration of its switching operation

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We report on the successful fabrication of MEMS-integrated photonic crystal (PhC) waveguide device and the first experimental demonstration of mechanically-controlled switching operation. In MEMS-Integarated PhC devices[1], optical characteristics of PhC can be controlled by changing the evanescent interaction between the lightwave in the PhC and an external dielectric structure, which is actuated by MEMS. The device fabricated in this study consists of SOI PhC line-defect waveguide and a 1-μm-thick poly-silicon plate separated by 500 nm from the PhC waveguide. The plate length along the PhC waveguide was 5 μm. By applying a voltage, the plate approaches to the PhC waveguide and the transmitted light through the waveguide can be switched off. We observed the transmittance at a wavelength of 1.55 μm as a function of applied voltage and demonstrated the switching operation with an extinction ration of ~10 dB at an applied voltage of 20V. This scheme can be applied to tune device characteristics of several kinds of PhC devices.

[1] S. Iwamoto and Y. Arakawa, *IEICE Trans. Electron.*, **E87-C**, 351 (2004).