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Optomechanical waveguide system for switching telecom light TOMOHIRO TETSUMOTO, TAKASUMI TANABE, Keio University — We numerically study an optomechanical directional coupler switch based on silica zipper cavity. Unlike silicon, silica is transparent in both visible and telecom wavelength, which allows the device to operate with ultra-broad wavelength. The zipper cavity is composed of pair of one dimensional photonic crystal ladder, which we use as an opto-mechanical tunable active directional coupler. We modulated the lattice constant of the Bragg mirror to enable mode-gap confinement at visible range ($Q \approx 2 \times 10^4$). The signal is telecom light, of which wavelength is below the mode-gap and can propagate the waveguide without exhibiting mode-gap confinement. At initial state, signal light can evanescently couple from one ladder to another, which allows the device to behave as a directional coupler. We next change the gap between waveguides by means of optical force induced by visible pump light. This changes the coupling rate and switches the propagation direction of the light. The induced force is calculated as 0.1 μN/pJ. This shows that the gap will broaden over 100 nm with 50 pJ pumping energy. This displacement will change the coupling rate between two waveguides and allows waveguide switching. We showed the switching of visible light with telecom light, and demonstrated numerically that the extinction ratio for this switch is over 15dB.

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