Abstract Submitted
for the SES06 Meeting of
The American Physical Society

Tuning Silicon Photonic Crystal Band Gap by Oxidation and Etching. MAKHIN THITSA, SACHARIA ALBIN, Old Dominion University — Tunability of photonic bandgap is restricted by the limited number of parameters that can be varied. In triangular silicon photonic crystal consisting of silicon pillars in air background, it is difficult to fine tune the photonic band gap because the gap is too sensitive to the change in atom radius. When silicon atom is etched from the radius of 0.28*a (a = lattice constant), to 0.1* a, the TM band gap drastically changes from 0.095 to 0.16 normalized frequency value, and the midgap frequency shifts from 0.325 to 0.49. In this paper it is demonstrated that by oxidizing the silicon and etching the silicon dioxide, the band gap can be tuned in a much finer scale by varying the oxide thickness. Plane wave expansion method is used for modeling the process. In our model, when silicon pillars are oxidized so that silicon is consumed and silicon radius goes from 0.28*a to 0.1*a, the band gap changes very slowly from 0.095 to 0.1 and the midgap from 0.325 to 0.42. After that the silicon dioxide is etched, and the band gap and midgap frequency changes slowly with the oxide thickness. Along this path the band gap moves from 0.1 to 0.16 and the midgap frequency from 0.42 to 0.49.

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Date submitted: 21 Aug 2006 Electronic form version 1.4