# Surface second harmonic generation from silicon pillar arrays with strong geometrical dependence

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## Abstract:

We present experimental demonstration and analysis of enhanced surface second harmonic generation (SHG) from hexagonal arrays of silicon pillars. Three sets of Si pillar samples with truncated cone-shaped pillar arrays having periods of 500, 1000, and 2000 nm, and corresponding average diameters of 200, 585 and 1550 nm, respectively, are fabricated by colloidal lithography and plasma dry etching. We have observed strong dependence of SHG intensity on the pillar geometry. Pillar arrays with a 1000 nm period and a 585 nm average diameter give more than a one order of magnitude higher SHG signal compared to the other two samples.We theoretically verified the dependence of SHG intensity on pillar geometry by finite difference time domain simulations in terms of the surface normal E-field component. The enhanced surface SHG light can be useful for nonlinear silicon photonics, surface/interface characterization, and optical biosensing.

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