

Micron-pyramid Anti-reflection Structure in Tereahertz Frequency

by

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ABSTRACT

The research presented in this thesis focuses on anti-reflection silicon device in terahertz (THz) range. Silicon devices with micro-pyramid anti-reflection structure are fabricated with period from 30 μm to 110 μm . Simulation of THz wave transmission through these silicon devices are performed using graded-index method and matrix theory. Then these silicon devices are tested by THz Time-Domain Spectroscopy (THz-TDS) in the frequency range of 0.2 THz to over 4 THz.

Enhanced transmission of broadband THz electromagnetic waves in the frequency range of 0.2 THz to 3.15 THz is realized using silicon device with micro-pyramid surface structure. A maximum of 89% reduction in reflectivity is observed when the device with 60- μm -period micro-pyramid structures is used, comparing with reflectivity of planar silicon wafer. By varying the period of micro-pyramid structure from 110 μm to 30 μm , the cut-off frequency of enhanced transmission is tuned from 0.74 THz to 2.93 THz and the bandwidth of enhancement increases from 0.91 THz to 3.15 THz, respectively.