

Role of micro and nanostructures in enhancing near IR optical absorption in silicon

Abstract

Role of micro and nanostructures in enhancing IR transmission in Si wafers has been investigated. Based on feature dimensions, incident light interaction can be described in terms of: (a) geometrical optics for wavelengths significantly smaller than surface dimensions, (b) diffractive optics for wavelengths comparable to surface features, and (c) physical optics for wavelengths substantially larger than surface features. Randomly distributed features in micro and nanoscale regimes were fabricated on identical Si wafers. A simple IR optical transmission system based on InGaAs photodetector and monochromator was developed for optical measurements. Optical transmission near the bandgap was substantially reduced by randomly distributed nanostructures likely attributed to diffractive optics. At the conference, details of several structures along with their reflection and transmission measurements will be presented in order to determine optimum surfaces for lowest transmission near the bandgap.

Keywords

IR transmission; Light trapping; Randomly textured micro and nanostructures; Solar cells