MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Specialised Technologies, Including Nanotechnology (8)

Author: Dr. Yongan Tang
United States, tangy@nccu.edu

LIGHT ABSORPTION IN THIN FILM VIA NANO PARTICLES

Abstract

Due to its low cost and less weight, the thin film solar cells are very attractive to application on space craft; The hydrogenated alloy of amorphous silicon (a-Si:H) has high optical absorption than other materials, a-Si:H thin film solar cells are able to improve the absorption efficiency, since the minority carrier diffusion length is less than or around 300nm for amorphous silicon. However, a limitation in all thin film solar cell technologies is that absorbance of red spectrum is too small, because of silicon indirect bandgap. To overcome these light-trapping problems and to increase light absorption, method based on excitation of surface plasmons via scattering from noble metal nanostructures was explored. We study the optical absorption efficiency of the a-si:H thin film with nano-metallic particles, and investigate the size and shape of these nano-particles. Our simulations show that for a 100nm thick a-Si:H thin film deposited with an array of nano-metallic cubes or cylinders, the optical absorption will increase dramatically in the red light (e.g. 650nm), and the incident light with an angle has better absorption too. We deposit nano particles on thin film via electron metal evaporation method, and the patterns of the particles were created by electron lithograph beam. Our experimental study show light absorption enhancement in red light region.