Multi-type particle layer improved light trapping for photovoltaic applications - DTU Orbit

(31/12/2018)

Multi-type particle layer improved light trapping for photovoltaic applications

This work discusses regular particle arrays as nanostructured front layers for possible application in photovoltaic devices yielding strongly increased forward scattering. I used a rigorous plane-wave method to investigate multi-type particle layers combining different radii and configurations. The absorbance was enhanced compared to the bare Si wafer and I demonstrated on mixing particles a broadband boost in the absorbance within the homogeneous wafer region, excluding parasitic absorption in the particle layer. I studied the efficiency enhancement for varying geometries. Multi-type layers made of Si disks with two different radii achieved up to 33% (24%) and with four different radii up to 40% (30%) improvement in the short circuit current and integrated absorbance, respectively, without yet standard anti-reflection coatings. Broadband efficiency enhancement for metal multi-type layers was not observed because they show strong parasitic absorption and boost the absorbance only in narrow wavelength regions. (C) 2016 Optical Society of America