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Preparation and characterization of TiO2 anti-reflective layer for textured Si (100)

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Recently, anti-reflective films (AR) are one of the most studied parts of a solar cell since these films improve the efficiency of photovoltaic devices. Also, anti-reflection films on the textured silicon solar cells reduce the amount of reflection of the incident light, which improves the device performance due to light trapping of incident light into the cell. Therefore, we preformed two step processes to get textured Si (100) substrate in this experiment. Pyramid size of textured silicon had approximately 2～9 μ m. A well-textured silicon surface can lower the reflectance to 10%. For more reduced reflection, TiO2 anti-reflection films on the textured silicon were deposited at 600^{o}C using titanium tetra-isopropoxide (TTIP) as a precursor by metal-organic chemical vapor deposition (MOCVD), and the deposited TiO2 layers were then treated by annealing for 2 h in air at 600 and 1000 °C, respectively. In this process, the treated samples by annealing showed anatase and rutile phases, respectively. The thickness of TiO2 films was about 75 ± 5 nm. The reflectance at specific wavelength can be reduced to 3% in optimum layer.