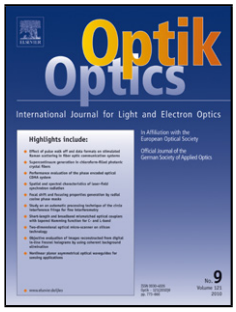

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Effect of surface texturization on minority carrier lifetime and photovoltaic performance of monocrystalline silicon solar cell

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Abstract

This paper presents the effect of surface texturization on the minority carrier lifetime and photoelectric conversion parameters of monocrystalline silicon solar cell. Two different wet-chemical texturization methods were employed to etch the monocrystalline silicon wafer surface. Morphology of the wafers was investigated by stylus surface profiler, field emission scanning electron microscope (FESEM) and surface reflection measurement (SRM) systems. Due to texturization pyramidal structures were formed on wafer surface as well as the surface roughness was increased by 3.07%. Untextured (S1) and textured (S2 & S3) samples were doped with phosphorus atoms with a constant flow rate of liquid phosphorus oxychloride ($POCl_3$) in a high temperature diffusion furnace. Solar cell was fabricated using both untextured and textured silicon wafer. Maximum 1.66% decrease of optical reflectance was found in textured solar cell. The minority carrier lifetime and photoelectric parameters were investigated using surface photovoltage (SPV) and light-current-voltage (LIV) measurement system respectively. Minority carrier diffusion length and minority carrier lifetime were increased significantly in textured solar cell. Thus, surface texturization plays an important role on increasing the energy conversion efficiency of silicon solar cell.

Keywords: monocrystalline silicon solar cell; wet-chemical texturization; diffusion length; minority carrier lifetime; photoelectric conversion efficiency.

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