

Hydrogenated amorphous carbon based solar cells by pulsed laser deposition with mixture of graphite and camphor as precursor materials

Abstract

The authors have deposited hydrogenated amorphous carbon films (a-C:H) on quartz and p type silicon substrates (100) by pulsed laser deposition (PLD) using a mixture of graphite and camphor powders at room temperature. The presence of hydrogen in the a-C:H films has been revealed by fourier transform infrared spectroscopy (FTIR) measurement. The solar cell structure of a-C:H/p-Si was also fabricated. The formation of a heterojunction between the a-C:H films and silicon substrate was confirmed by the current–voltage (I–V) measurement in the dark and under illumination conditions. The structure of a-C:H/p-Si showed photovoltaic characteristics with an open circuit voltage V_{oc} of 400 mV and short circuit current density J_{sc} of $\sim 15 \text{ mA cm}^{-2}$ under illumination [air mass (AM) 1.5, 100 mW cm^{-2} , 25°C]. From the calculation, the energy conversion efficiency and fill factor were found to be approximately 2.1% and 0.38 respectively. The carbon layer is contributed to the energy conversion efficiency, which was proved by the measurement of quantum efficiency.