TW-P028

Analysis of Single Crystal Silicon Solar Cell Doped by Using Atmospheric Pressure Plasma

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The doping process of the solar cell has been used by furnace or laser. But these equipment are so expensive as well as those need high maintenance costs and production costs. The atmospheric pressure plasma doping process can enable to the cost reduction. Moreover the atmospheric pressure plasma can do the selective doping, this means is that the atmospheric pressure plasma regulates the junction depth and doping concentration.

In this study, we analysis the atmospheric pressure plasma doping compared to the conventional furnace doping. the single crystal silicon wafer doped with dopant forms a P-N junction by using the atmospheric pressure plasma. We use a P type wafer and it is doped by controlling the plasma process time and concentration of dopant and plasma intensity. We measure the wafer's doping concentration and depth by using Secondary Ion Mass Spectrometry (SIMS), and we use the Hall measurement because of investigating the carrier concentration and sheet resistance. We also analysis the composed element of the surface structure by using X-ray photoelectron spectroscopy (XPS), and we confirm the structure of the doped section by using Scanning electron microscope (SEM), we also generally grasp the carrier life time through using microwave detected photoconductive decay (u-PCD).

As the result of experiment, we confirm that the electrical character of the atmospheric pressure plasma doping is similar with the electrical character of the conventional furnace doping.

Keywords: Atmospheric pressure plasma, Plasma doping, Concentration of dopant, Plasma intensity